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ALICE EASTWOOD,

EDITOR.

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Errata Vol. III.

Page 52, for "Ammostrephes" read "Ommastrephes."
" 203. first genus, place second bracket after Richardson.
" 204, No. 11, for "Dona Ana County, New Mexico," substitute "Texas"
" 206, third line, for "James's Bay, Hudson's Bay," read "James Bay, Hudson Bay."
" 206, No. 12, for "macrohabdotes," read "macrorhabdotes."
" 206, No. 15, for "Valley of the Sacramento River," read "Foothills of the Sierra Nevada."
" 208, No. 28, omit "Northwestern New Mexico."
" 213, No. 82, for "nebracensis," read "nebrascensis."
" 220, No. 165, for "Sorrex." read "Sorex."
" 223, eighteenth line, for "Dobson, Mon. Insectivora," etc., read "Dobson, Ann. & Mag. Nat. Hist., 5th ser., xviii, 1886, 124–125."
" 261, seventh line from bottom, for "Am. Rept." read "Ann. Rept."
" 261, second line from bottom, for "Forsteri," read "fosteri."
" 279, fifth line, for "Berkeley," read "Los Angeles"
" 279, twenty-fifth line, for "William M. Price," read "William W. Price."
" 117, in title, for "albicolis," read "albicollis."

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VOL. III. JANUARY, 1893. No. 4.

CONTRIBUTIONS TO WESTERN BOTANY. No. 3.

BY MARCUS E. JONES.

CAULANTHUS CRASSICAULIS Watson, is perennial. The four stamens are declined and close pressed to the lower petals, and the two others are as tightly pressed to the upper petals, after the fashion of the Labiate stamens. This grows in loose soil in alkaline valleys as well as in better-drained localities with little alkali. It blooms mostly in the month of May, and is common in Western Utah as well as in Nevada.

STANLEYA VIRIDIFLORA Nutt. The very imperfect description of the type in Coulter's Manual, King's Report, and the better one in the Flora of North America, Torrey and Gray, make it uncertain whether this plant is a new species or not. The salient points of the type are the simple stem, erect and glabrous, leaves cuneate-obovate ("obovate or lanceolate," Watson in King's Rep.), entire or few toothed at base of stem, upper ones rapidly reduced so that the upper stem is nearly naked, entire ("lanceolate, sessile, clasping," Watson l. c.); raceme long and crowded with flowers, which are greenish yellow, with linear sepals and petals, anthers very long and linear, pedicels ½ inch long, stipe an inch ("½ inch," Watson l. c.); long and narrow torulose pod. Said by Nuttall to grow on shelving hills, and apparently by Watson in valleys.

My plants, of which I have a large suite gathered at different places, and which I carefully studied as they grew, are short-lived perennials (3 years old at least), with stems all ridged and more or less winged throughout, the wings sometimes about a line high; leaves lanceolate, barely acute and entire, but with two rounded lobes at the truncate base, root leaves pseudo-petioled and wing margined, as also the lower stem leaves, 6 to 12 inches long and ¾ inch wide, thick, leathery, and light green, smelling like cabbage,

stem leaves rapidly reduced upwards, sessile, apparently (but not) clasping, uppermost ovate to sagittate, or hastate, acuminate, the rounded or almost acute lobes 3 to 4 lines long, petioles of root leaves grooved; spikes sessile and in the fully developed plants many branched; the central branch long, 1 to 2 feet, densely flowered; sepals in the bud greenish yellow, after anthesis purple (usually) and reflexed, linear-oblanceolate, obtuse, concave, almost hooded; blade of petals crumpled crosswise, edges jagged, linear, ½ line wide, yellowish green, inconspicuous, 4 to 6 lines long, and thin, claw thick, fleshy, triangular subulate, 6 lines long and a line wide at the saccate base, glabrous, whole petal just equaling the filiform filament, which is round, glabrous, and scarcely enlarged at base, anther loosely coiled 2½ lines long, obtuse, narrowly linear, fixed by the very base and one-sided; pedicels in flower 2 lines long ascending and in fruit 4 lines long and horizontal; pods drooping, 2 to 3 inches long, stipe 8 to 10 lines long, septum less than ½ line wide. It grows among pinons and cedars on gravelly southern slopes of hills at 6,500 to 7,000 feet altitude in the Schell Creek and Sprucemont Ranges, Nevada, and flowers about July 15 to August 15. The greenish yellow sepals are rather conspicuous. It is not very common It differs from the type so far as the descriptions go in the winged stems, branching habit, crumpled petals, auricled or hastate upper leaves, and longer pendent pods. But it may be that these characters were overlooked in the type. Should this plant prove to be distinct it may bear the name of *Stanleya collina.*

LEPIDIUM HETEROPHYLLUM. I propose this name for the *L. montanum* var. *alpium*, Watson, King's Rep. and *L. integrifolium* var. *heterophyllum*, Wat. Am. Nat., Ix, 268. I fail to see anything warranting the connection of this shrubby based, cliff-growing, decumbent, high altitude plant with *L. montanum* or the alkali-loving *L. integrifolium* of the valleys. It reaches an altitude of nearly 9,000 feet in the Wasatch and shows no gradation into either species either in habitat or character so far as I know.

POLYGALA ACANTHOCLADA Gray. It may be of interest to give the characters of the flowers of this plant as they are in nature and not in dried specimens: Green parts of calyx 3, ovate, barely acute, 1 line long, the two upper (this is as the flower appears on the plant with the keel uppermost) close together, lower one alone, the two

petal-like ones obovate-oblong, widely spreading, cucullate, barely acute, 2 lines long, ascending, white; keel truncate, 1½ lines long, 1 line wide, broadly obovate, greenish; banner oblong-linear, expanded at end and rhomboidal, erose and notched, greenish, tip purple with veins running down ½ line, 2 lines long in all. The keel has an oblong orifice with the lips turned back at more than a right angle; stigma truncate or club shaped and included in the hood; pod oblong ovate, 2½ lines long and 1½ wide, deeply notched. The plant is a shrub 1 to 3 feet high, with gray bark and stems often an inch thick, widely and rather intricately branched and spiny. Gravelly hillsides in dry places. I have collected it at Lee's Ferry on the Colorado River near Southeast Utah, and found it common in Western Utah and Eastern Nevada.

VIOLA BECKWITHII Torr. The description of this plant in King's Rep. is inaccurate, but the figure, etc., in Beckwith's Rep. are better. The following are the characters of our plant as it grows here; it is locally abundant. Stigma cuneate and truncate, glabrous, petals also glabrous, 2 upper ones dark purple, the rest white with a yellow claw and purple veined, lower petals broad, truncate or emarginate, flowers rather large; sepals linear oblong, spur not over a line long; pubescence minute and dense; leaves 3-divided, divisions petiolulate, lateral ones 3 to 6 lines long, terminal ones 6 to 12 lines long, lobed or cleft into many linear or oblong segments.

LUPINUS SULPHUREUS Douglas. This little known plant I discovered growing abundantly in Eastern Nevada, and I think it is quite probable that it will be found to be nearer *L. sericeus* than has been supposed. My notes on the flowers were taken as they grew. When the flowers are just opening they are white with a yellow streak in the middle of the banner, which is also flecked with 4 or 5 small purple spots; the whole flower soon turns yellow, the middle of the banner deeply so. The calyx is long-spurred, spur and all but the tip of the upper part of the calyx white and streaked with blue, the lower part of the calyx and tips green. It grows 1 to 2 feet high, in clumps from a hard woody root, on gravelly slopes, flowering in June. I have a very few specimens with a suspicion of blue on the banner.

PSORALEA CASTOREA Watson. As I suggested in a previous note (No. 2) this includes *P. mephitica* Watson. A careful compari-

son of my many specimens from Southern and also Eastern Utah and Colorado shows that the distinctions relied upon by Watson to separate the two species are valueless, while the "mephitic" odor was doubtless due to the animal rather than the vegetable kingdom.

The following characters will fit my suites of specimens. Leaves 1½ inches long, from rhomboidal obovate to spatulate, acute, apiculate or retuse: stipules persistent or caducous, the larger ones 1 inch long, ovate, obtuse, and persistent, the smaller ones ⅓ inch long, ovate-lanceolate, abruptly contracted into a long acumination and caducous; stems none to 4 inches long; petioles 2 to 6 inches long; peduncles shorter than the leaves; bracts ovate, scarious, obtuse to abruptly contracted and with a long acumination, equaling the scarious, inflated calyx and blue and white petals; calyx lobes linear to lanceolate, acute or long acuminate; spikes 1 to 3 inches long; peduncles 1 to 4 inches long and stout; pods lanceolate, glabrous below the middle and long villous above it; roots very deep and apparently tuberous, but really woody and all connected underground; whole plant densely pubescent, with short or long hairs, upper side of leaves less so or glabrous. Grows in patches either in sandy places or on rocky slopes in dry places; flowers in May.

ASTRAGALUS. Doubtless many have had much difficulty in determining species in this genus from the flowers alone; at least I have found it exasperatingly so, and, as the pods are often not to be had when the flowers are seen, and as the flowers have been almost ignored, I began some years ago to study the flowers with a view to determine if they had any specific value, and with good results; how good cannot yet be determined fully.

I find that the arching of the banner and its shape are valuable, the shape of the sulcus in the banner, the shape of the white spot on the banner in a general way, and the backward folding of the sides of the banner are valuable; the shape and length, as well as the position of the wings, are valuable. Often the wings are concave to the keel or flat, horizontal, or arched upwards, connivent over the keel or with the blade edgewise to it, and so like the outspread wings of insects. The shape of the keel, its arching and tip, are also of value in separating species. I find little or no difficulty in separating species by these characters in conjunction with the leaves. Whether they are of value in making sections I doubt,

but they are good in making smaller divisions, where now we have considerable difficulty. I hope Californian and Northern botanists will report on these things with their species. It is necessary to take the notes on flowers when they are growing, and as soon as they are fully opened, before they have assumed a false position of banner or wings. The following are my notes on living flowers, with descriptions of some new species, following the order of Watson in King's Rep. in a general way:—

ASTRAGALUS DIPHYSUS Gray. Banner broadest at base, sides slightly reflexed at the top, not at all at base; white spot broadly cuneate and very slightly notched at top. It comes within a line of the tip of the banner. The banner is ascending less than 30°, sulcus V shaped. The calyx is cleft on the upper side, acute at base, and the lobes are unequal, the lower the longer.

ASTRAGALUS DIPHYSUS Gray var. LATUS. Like the type but the leaflets 3 to 5 lines long, 6 to 8 pairs, ovate or obovate to oval, obtuse to emarginate; calyx teeth shorter and broader, 1 line long, the tube 3 lines long; pod oval, straight, abruptly acute, completely 2 celled, rather deeply sulcate both dorsally and ventrally. Whole plant glabrous even to the pods, subdecumbent; lower stems enduring from year to year, many stemmed from a deep, thick, woody root, stems spreading more or less underground. The flowers are purple from a light-colored base, 6 lines long, and the cross section of the pod is nearly two circles, joined at the side. Schell Creek Range, Nevada, May, on the hillsides.

ASTRAGALUS BECKWITHII Torrey. Flowers cream white, never purple; banner almost erect, deeply notched, sides not at all reflexed, except at a point opposite the tip of the keel, where it is turned back for a space of 2 lines long, and at a point near the tip, and so is fiddle shaped, water lined. The sulcus in the upper part is broadly V shaped, but in the lower part of the banner it is almost circular, making the base of the erect part of the banner very convex on the outside, and narrowed at its insertion into the enlarged club-shaped lower part, and this narrows as it enters the calyx; banner 4 lines wide and 6 lines long above the calyx; wings obliquely oblanceolate, narrowed at the tip and nearly acute, 2 lines wide, nearly straight, 3 lines longer than the keel; keel long and narrow, slightly incurved, faintly purple veined at tip; leaflets generally emarginate;

pods without mucilaginous matter. This is quite common from the Wasatch Mountains to the western side of the Fish Spring Mountains, in Western Utah. West of there it is replaced by the next. It grows on gravelly hillsides. Pods purple spotted, thin and acute at each end.

ASTRAGALUS BECKWITHII Torrey var. PURPUREUS. This plant, though it has all the marks of a good species, I do not feel like describing as such till one or two things can be settled about it. Banner purple, fiddle shaped, notched at top and broad at base, arched to nearly 90° and abruptly, white spot fan shaped and streaked deeply (to the base on the sides) with purple; sulcus ¼ circle except at the base, where it is semicircular, fusiform longitudinally; the purple streaks on the white spot are united at the base of the sulcus into a purple ring; the banner is bent at a point 2 lines beyond the calyx teeth; wings obliquely ovate, rounded and obtuse at the apex, white from the tip to the keel and purplish beyond, upwardly curved, 2 lines wide, 2 lines longer than keel; keel purple and very dark at tip, incurved 100° to base, blunt. Whole flower curved upwards, purple and never yellowish except when old. The other characters are leaflets 6 to 12 pairs, inclined to be diamond shaped, 6 lines or less long and over ½ as wide, rounded, truncate or retuse; stems ascending, angled as well as petioles and pedunc1es; flowers 6 to 10, at first in a head but lengthening to 1 to 2 inches; penduncles shorter than the leaves; calyx as in the type, yellowish but with nigrescent hairs, tube 2 lines by 1½; teeth 1 line more, subulate from a broad base, almost black; calyx spreading in flower and reflexed in fruit, but the stipe (equaling the teeth) bent upwards so that the pod is nearly vertical; pod acuminate at each end, inwardly curved ventrally, so as to make ⅓ to ½ the arc of a circle, 1½ to 1 inch long, dorsal sulcus intruded ½ line, sulcate dorsally always at base, but not in the upper half when pod is much curved; when nearly straight and only acute at base and apex (which occasionally occurs) the pod is deeply sulcate, finely corrugated, cartilaginous, filled with a mucilaginous pulp when immature; seeds flattish, nearly round, with a prominent hilum, 1 line wide. Fully mature pods are usually obcompressed so as to be flat, while at the ventral suture they are compressed, making the cross section T shaped, usually purple spotted. This differs from

the type in the purple flowers, keel ½ broader, longer pod, which is cartilaginous and so thicker, pulpy pod, while the type has a thin and almost transparent pod, without pulp when young. If this latter point holds good in all cases, it is a good species. It is at once distinguishable from the type everywhere, and never has been found east of the Deep Creek Mountains in the western edge of Utah.

ASTRAGALUS CANADENSIS L. and A. MORTONI Nutt. have the following characters in common: Flowers in dense spikes, horizontal; calyx white, flattened, somewhat gibbous, hairy, tips broadly triangular and tufted with hairs, short; banner arched in a wide arc, sides reflexed, at tip the most, very little elsewhere; sulcus triangular and acute at tip of banner, rounded at base of banner; banner equaling the keel, ochroleucous; wings ascending and narrow, exposing both the tip and base of keel, obtuse, a line longer than keel.

ASTRAGALUS CANADENSIS has calyx decidedly notched on the upper side; bracts subulate, short; wings linear but slightly wider at blunt tip; keel little incurved; leaves in about 13 pairs and inclined to be lanceolate; spikes not denser fruited than in the other species. The keels of both species are veined.

ASTRAGALUS MORTONI Nutt. Calyx teeth not unequal; wings oblong-lanceolate, 1½ lines wide at base; keel purple tipped, arched to ⅓ of a circle; bracts ovate to lanceolate, 1 to 2 lines long; leaves inclined to be oblong and much smaller than in *Canadensis;* flowers in a closer and shorter head. Pods pubescent and densely aggregated, ascending as in the other species.

A. Canadensis was just coming into bloom at Grinnell, Iowa, on August 16, 1892, at 1,000 feet altitude, while *A. Mortoni* was well in bloom at Muncy, Eastern Nevada, on July 6, 1891, at 6,000 feet altitude.

ASTRAGALUS DODGIANUS, n. sp. Many stemmed from a woody root; stems very slender, flexuous, branching from the base, 6 to 24 inches long; stipules sheathing at the base, membranous and barely pointed, upper ones connate at base and very broadly triangular; whole plant except the glabrous pods minutely and sparsely pubescent; leaves 1 to 2 inches, with proper petiole ½ an inch; rachis leaf-like; leaflets 4 to 5 pairs, narrowly elliptical to linear, 2

to 4 lines long; peduncles 3 to 8 inches long, with racemose, scattered flowers on the upper half; flowers very small, erect to horizontal; calyx nigrescent, less than a line long; campanulate, triangular teeth a line long; calyx acute at base, on a pedicel ½ a line long, subtended by a triangular bract 1 line long; corolla arched; the very blunt, much incurved, and rounded, purple-tipped keel surpassing the calyx tips less than a line; wings oblong, entire, about a line longer than keel, ascending, flat to keel; banner abruptly bent at calyx tips to a right angle, 2 lines longer than keel, broad, deeply notched, white or light pink; pods ascending to pendulous, linear-oblong, dorsal suture straight, ventral slightly curved, minutely stipitate, flat and vetch-like, abruptly acute or apiculate, membranous, reticulated, with no trace of a dorsal intruding septum; seeds (6 to 10) broadly ovate to almost reniform. Were it not for the characters of the pod this might be referred to *A. Robbinsii*, var. *occidentalis*, Watson. May 7, 1891, at Thompson's Springs, Eastern Utah, on rocky slopes, rare. Named for Col. D. C. Dodge.

ASTRAGALUS IBAPENSIS, n. sp. Allied to *A. Robbinsii*, var. *occidentalis* apparently, but leaves seemingly quite different, and pod also. (?) The description of Watson's variety is very meager and gives almost no leaf or floral characters. This plant is very slender; stems ascending from a deep, erect and slender perennial root; leaflets 1 to 7, elliptical to linear, lower obtuse, the upper acute, all but the terminal ones 2 to 6 lines long, the terminal one twice as long as the others; upper leaves with one long, linear leaflet, acute at each end, 1 to 1½ inches long, 1 line wide, gradually tapering into the rachis or petiole, which is 6 lines long and not jointed to it, occasionally with a single falcate, very acute, linear leaflet at base; stipules ovate to broadly triangular and mostly connate, usually acute; very slender stems grooved; whole plant minutely strigose pubescent, even to the pods, which are more densely so and not black hairy; penduncles slender, racemosely arranged on stems, 1 to 2 inches long; flowers white, 1 to 3, at the top of peduncle; spreading pedicels a line long and with an ovate bract at base, apparent reflexed in fruit; calyx shortly campanulate, a line long and as broad; teeth triangular, ½ line long; corolla 3 lines longer than calyx and teeth; banner very broad, abruptly arched at tip of teeth

to a right angle, erect part 1½ lines long; keel surpassing calyx teeth 1½ lines, incurved with the end straight, blunt, purple tipped; wings barely equaling the keel; pod oblong-linear, very shortly stipitate, 6 lines long, 1½ lines wide, abruptly acute, both sutures prominent, flattened, apparently 1 celled, ventral suture arched, dorsal straight.

June 23, 1891, Deep Creek Mountains, Western Utah, at 5,500 feet altitude, among brush. The arching of the ventral suture of the above two species would suggest *A. Robbinsii*, as that feature is very rare in Western plants, but the racemosely arranged short peduncles and upper simple leaves are quite peculiar.

ASTRAGALUS BIGELOVII Gray. This in its flower is allied to the *A. eriocarpus* group along with *A. amphioxys*, and apparently should include the *A. Mathewsii* Watson if there are no other good characters than those given by Watson. Banner arched 80° in a gentle curve, sides reflexed from calyx to tip 100°, the folded part being 1½ lines wide at base and gradually reduced upwards so that the outline of the banner as one looks at it is oblong with straight sides and an enlargement at the base; sulcus a line deep and ¾ wide, broadly V shaped and continuous to the apex of banner, white spot occupying the whole of the sulcus and to within a line of the top of banner, narrowly oblong, emarginate, purple tinged below; base of banner, sides and tip rose purple, darker at the base; wings linear, ¾ line wide, with a little lobelet on upper side near the base, obtuse, ½ line longer than keel, ascending 30°, dark rose purple at base and the upper two lines white, nearly flat with the tips slightly incurved and so not quite vertical; keel dark purple-tipped, blunt and moderately incurved; banner rising 4 lines beyond the tip of keel, in all 5 lines longer than tip of calyx lobes; calyx pink, a little inflated, narrower with age and white, somewhat flattened, gibbous, ascending 45°; bracts 3 lines long and green.

Taken from specimens gathered at Rincon, New Mexico, April 15, 1892. It is also abundant in Eastern Utah.

ASTRAGALUS GLAREOSUS Douglas. The plants which I have hitherto distributed as *A. glareosus* are *A. Chamæleuce* Gray, while this plant occurs sparingly throughout the Great Basin region of Utah, and is credited to Southern Idaho, and by Coulter to Wyoming also. I have hitherto considered it as *A. Chamæleuce* but it

is clearly not that plant, and differs from *glareosus* in having a 2-celled pod that is 1 celled at apex only, the flowers also are cream white, and not "blue," indistinctly purple veined. Pods long, 1 to 2 inches, acuminate, lanceolate, fleshy when green, much compressed, 2 celled by the intrusion of the dorsal sulcus long-appressed hairy, often sulcate both dorsally and ventrally, dorsal sulcus very deep; banner extending 4 lines beyond the calyx teeth, slightly and gently arched, notched, sides reflexed at base only, 2 lines longer than the blunt, incurved and purple-tipped keel; sulcus deep, semi cylindric, wings linear, a little longer than the keel, horizontal at tip; calyx cylindrical, 5 lines long; teeth subulate, a line long or more, nigrescent peduncles 2 inches long, shorter than the leaves and prostrate in fruit except in the shade, leaflets narrowly lanceolate to narrowly oval, 3 to 5 lines long and 1 to 2 wide; whole plant coarsely silky pubescent with appressed hairs; stemless, not at all woolly. It grows under sagebrush in the valleys or lower hillsides and is quite distinct from any other species that I know. It flowers early in May.

ASTRAGALUS UTAHENSIS, T. & G. Though it is difficult to always separate this from *A. eriocarpus*, and less so from *A. Purshii* in the herbarium, yet it is not at all so in the field, since *A. eriocarpus* flowers at least a month earlier than *A. Utahensis* and is out of bloom before the other blooms. *A. Purshii* blooms as early or earlier than *A. eriocarpus* and is a high altitude plant, *i. e.*, does not grow in the valleys, the home of the other two species, though the latter sometimes go up to 7,000 feet altitude. In *A. Purshii* the pubescence of the leaves is quite different, while the matted habit and narrow leaves and short woolly pods distinguish it at all times. It would certainly be considered a hybrid from the other two if they grew together with it but they never do.

In *A. Utahensis* the banner is oval as one looks at it in the flower, rather deeply notched, white spot broadly cuneate, tridentate or with a single acuminate tooth from the center of the rounded or truncate apex, sides of white spot beautifully veined with narrow, nearly parallel purple lines running down to the base; banner brilliant pink purple; wings linear, 2½ lines longer than keel, slightly enlarged at tip, rounded or almost truncate, straight, purple throughout; tip of keel dark purple. This is one of the handsomest flowers in the West, but though very common in Central Utah seems to become less so westward.

ASTRAGALUS ERIOCARPUS Watson. Flowers brilliant pink purple, and closely resembling those of the above, but sides of banner not at all reflexed, either notched ½ a line deep or not at all, ascending 45° or less; white spot almost obliterated by rather broad, palmate, purple veins, which are united into a solid purple spot at base; sulcus in banner semi-cylindric; wings a line longer than keel. Deep purple tipped, obtuse, scarcely broadened at base, a little narrowed at apex; keel dark purple, scarcely incurved, very blunt; flowers nearly as large as in *Utahensis*, but fewer. It is abundant in the valleys, but not in alkaline soil.

ASTRAGALUS AMPHIOXYS Gray. This plant has no characters that I do not find in *A. Shortianus*, except the pubescence of the calyx, which in the former is appressed and silky or strigose, and in the latter is spreading and loose. The shape of the pods, that both Gray and Watson had to abandon in regard to *A. cyaneus*, is equally valueless in the new species created. There may be a character in the flowers to keep up the species, as well as the pubescence. I have not studied *A. Shortianus* in flower as I have the present species. I have never seen any true *A. Shortianus* in Utah or Western Colorado, all the plants belonging to *A amphioxys*, which is very common. The usual form has the banner of the flower ascending remotely from the calyx, which gives the flower a slender, long look, but there are forms with a short corolla. There are also three forms of pod. One is the typical pod, as described by Gray, not fleshy to any extent. Another has a shorter pod, which is less acute at apex, often small, and rather blunt at base. The other has a very fleshy pod, which, on drying, becomes wrinkled with prominent sutures and intermediate in form. While all these forms run together, and have no floral character that is constant, so far as I have seen, they all, without exception, have the appressed pubescence of calyx. The floral peculiarities are brilliant pink purple flowers; banner with sides reflexed 10° to 60°, or even more. When little reflexed the outline is oval, when much it is oblong or tapering upward, ascending; sulcus 3 lines broad and very shallow, only concave, 4 lines long, white spot truncate and often deeply notched, oblong or broadly cuneate, ragged on the upper end, with little purple veinlets, stippled with fine purple spots; banner darkest near the white spot, lighter on the edge; wings linear to oblong lanceo-

late, rounded, obtuse, oblique, ascending, concave to keel, nearly horizontal and connivent over the keel, forming an arch over it, 2 lines wide and ½ a line longer than keel, purple; keel all purple. One form has banner 5 lines long, short; calyx 3 lines long, and teeth 1½ lines long; pods hoary, and whole plant densely silky. Another form has fleshy pods, less hairy; calyx 4 lines and teeth 1 line long; keel rounded, ½ narrower than the above; flowers 8 lines long. This plant is instantly recognized by the arched and connivent wings and stippled white spot.

ASTRAGALUS CHAMÆLEUCE Gray. (Distributed by me as *A. glareosus*, but not in my sets.) Flowers 1 inch long, pink purple, few; banner in flower oblong-oval, sides reflexed 45°, plain, dark pink-purple with darker veins, tip with a central notch ¾ line deep, and with two shallow ones adjoining, seldom absent; white spot comes within a line of the edge all around and as low as the keel, narrower below, obovate-cordate, edge ragged, with red-purple veins; below and a line apart are two patches of anastomosing red-purple veins; wings narrowly oblong, dark purple at tip, oblique, rounded, tip twisted just below tip of keel, and horizontal; keel narrow 2 lines below tip, blunt and rounded, dark purple at tip; pod very fleshy, cartilaginous, and sparsely short hairy. It always grows in firm, damp meadows, in mountain parks, or high valleys. It blooms in June and July. It is a matted, woody-rooted, prostrate, densely branched, silvery plant, with short peduncles among the leaves.

ASTRAGALUS IODANTHUS Watson. This is the most variable plant of the genus in Utah, and may include several species recently erected. The sides of the banner are reflexed, so that the outline is oblong, notched; white spot, deep purple veined; banner deep purple below, and shading to white at tip, or purple throughout, slightly sulcate, ascending 30°, sides most reflexed at base; wings long, dark purple at base, and white from tip of keel to apex, 3 lines longer than keel, rounded, obscurely erose or notched, ascending near the tip. The pod is fleshy, black hairy or nearly glabrous, plain or spotted, straight or arched into a semicircle, round or obcompressed, sulcate or not. It grows everywhere except on alkaline flats in the valleys, but does not go beyond the higher foothills of the mountains.

ASTRAGALUS PEABODIANUS n. sp. Inflati. Perennial, matted cæspitose from a branching root; stems 3 to 6 inches long, densely branched and prostrate, very leafy, root not woody; leaves 1 to 2 inches long, including the ½-inch petiole; leaflets 4 to 8 pairs, 3 to 4 lines long, 1 to 1½ wide, oblanceolate to narrowly oval, rounded at apex and acute at base, edges contiguous, softly pilose with spreading hairs, as well as all the rest of the plant, even to calyx and legume, but the latter rather densely long pilose; peduncles an inch long, 3 to 6 flowered, and loosely so; flowers ascending, in fruit horizontal, pedicel very short; calyx campanulate, a line long, teeth the same and setaceous; banner abruptly reflexed at tip of calyx teeth, broad, notched, white or purple, 3 lines long, erect part 2 lines long; purple tipped keel surpassing calyx teeth by 1½ lines, arched, the acute tip incurved to nearly a semicircle; wings barely surpassing keel, lanceolate, entire, obtuse; pods 6 lines long, membranous, ovate or lanceolate, acute, sessile, when ripe incurved to nearly a semicircle, cross section triangular and acute at ventral suture, with rounded lobes at base, dorsal septum not intruded, but dorsal sulcus always so at base of pod and to the middle; 1 celled, no intrusion of ventral suture, but the suture is rather thick, while the dorsal is inconspicuous.

Resembles *A. Parryi* in habit, and is allied to *A. triflorus* and *A. triquetrus*, but quite different; clay soil, at 5,000 feet altitude, Thompson's Springs, Eastern Utah, May 7, 1891. Dedicated to George Foster Peabody.

ASTRAGALUS GEYERI Gray. Banner oval to ovate, but sides generally turned back at some angle less than 90°, then the outline is oblong, slightly notched, white or very light purple. faintly purple veined; white spot scarcely visible, coming within ½ a line of the sides and end; banner ascending to 75°; sulcus shallow, scarcely contracted at base; banner 1½ lines longer than wings, and wings 1 to 1½ lines longer than keel; blade of wings obliquely ovate, obtuse, ascending 30°, 1 line wide; keel a line longer than calyx teeth, incurved 100°. I have doubts that it is annual, for the slender roots seem to have tubers on them. Very common in gravelly or light soil in the valleys and lower slopes. It blooms May to June.

ASTRAGALUS PLATYTROPIS Gray. This interesting subalpine plant is found only on the high mountains, occurring as far east as the

Schell Creek Mountains only. It may, however, exist on the Deep Creek Mountains. It is one of the earliest bloomers, close to snow. It is inclined to spread from the roots, but never forms mats. It is rare. Banner white or dirty, tinged with yellow, varying to light lead colored, bent abruptly to 45°, from mouth of calyx, concave, and so the sulcus is very widely V shaped, hooded at apex by the narrowing of the sulcus, 3 lines long, notched, and often with accessory notches, about as broad as long but a little wider at base than apex, sides not reflexed or but little, slightly purple veined opposite mouth of calyx; wings arcuate upwards and exposing the whole keel, obliquely lanceolate oblong, or nearly so, obtuse tip bent outward forming with the keel the letter T, just equaling the keel; keel abruptly bent 90°, purple, dark at tip, point rounded, equaling the banner; pod dark and dark purple mottled, ovate, ¾ by ½ inch, abruptly pointed, straight, papery, and much inflated, oblong oval, cross section oval contrary to the partition and emarginate on each side, prostrate when ripe. Scapes erect to decumbent. July.

ASTRAGALUS TOANUS n. sp. Allied to *A. nudus*. Lower leaflets 3 to 6 pairs, upper ones reduced to the long and cylindrical rachis; pods 2 to 4 on the ends of rather long peduncles; erect, ¾ to an inch long, 3 lines wide, compressed, erect, straight or curved, acute, thick and corrugated, both sutures prominent; sessile, lanceolate oblong, with very acute edges, cross section elliptical, seeds 1½ by 1 lines, calyx teeth minute, triangular; calyx 3 lines long. This grows in clumps like the others of the section. It is nearly glabrous throughout, erect, 2 feet high. It was out of flower July 21, 1891.

Found on the slopes of the Toano Range, Eastern Nevada, in open ground. It can neither be referred to *A. nudus*, *A. pectinatus*, or *A. Grayi*, but is intermediate between *A. nudus* and *A. pectinatus*. It may be that all four are forms of one polymorphous species, but I do not know of connecting forms.

ASTRAGALUS ARTIPES Gray. This plant is so like *A. Beckwithii* (except possibly the fiddle-shaped corolla) that it will be passed over generally when not in fruit; however, the calyx teeth about equal the tube, and are thread-like at tip; pod 1½ by ¾ inches, spotted, straight, tip slightly curved and almost blunt, base truncate; stipe equaling the calyx teeth; no apparent dorsal suture, ventral not prominent nor inflexed; pod probably round in cross section but

somewhat flattened or sulcate ventrally, 1 celled; seeds not round; calyx erect in fruit; pods erect or spreading. It is 1 to 2 feet high, slender. It was collected in gravelly soil at about 5,000 feet altitude in Utah Valley, May 16, 1891. The leaflets are broadly lanceolate to oval, obtuse to emarginate, 3 to 6 lines long, 10 to 14 pairs. Hitherto this has been supposed to be a southern species, but it has doubtless been overlooked.

ASTRAGALUS CALYCOSUS Torrey. This most interesting and badly named little species proves to be very common in all the ranges and hills west of the Wasatch Mountains, Utah. I have gathered it as far west as Humboldt, Nevada. Watson's description in King's Rep. is faulty also. Outline of banner oval, cleft a line deep, sides reflexed 100°, generally cream white but often purple; white spot broad, with cuneate sides to the middle where it widens again, broadly emarginate at apex; sulcus rectangular and broader than deep; wings very closely appressed to keel its full length, red purple to tip of keel, white beyond, deeply cleft, lower lobe 1 to 2 lines long and like a normal wing, the upper lobe is ⅓ wider, bent upward and inward till it touches the banner, both lobes narrowed and rounded at tip, usually from the cleft in the wings a long thread like lobe arises and is nearly as long as the lobes; keel enlarged just above the calyx so as to make a hollow in the banner, with a decided hump near the base of keel; calyx notched deeper on the upper side; pod always arched when well developed, acute, 4 to 12 lines long, 2 celled, cross section ovate with a cordate base. Flowers erect or prostrate, pods narrowly oblong to linear, usually prostrate. It is not subalpine, as given by Watson; it is rare above 7,000 feet altitude and abounds in the valleys in gravelly soil, 5,000 to 7,000 feet altitude. Torrey's and Watson's specimens seem to have been starved and with a poorly developed pod.

ASTRAGALUS ATRATUS Watson var. STENOPHYLLUS n. var. Flowers smaller, leaves narrowly linear, short, minute, or wanting, and only the rachis present, always so in the upper leaves.

This is No. 3840 of my sets of 1882. Collected June 14, 1882, at Palisade, Nevada, distributed as "Astragalus n. sp."

ASTRAGALUS FILIPES Torrey. I believe there is an earlier name for this, but the old name will be the more familiar, and equally as good for my purpose. Banner light cream colored, arched at right angle,

oblong, 4 lines longer than keel, expanded at base like *A. Beckwithii*, sides reflexed 20° or less, groove very shallow and acute, scarcely narrower at base, not enlarged or narrowed on the outside toward the base; banner acutely notched at apex, ¾ line deep; wings obliquely obovate or lanceolate, ascending 45° so as to expose the bottom of keel, concave to keel, entire or obscurely toothed at rounded apex; keel incurved 100° or more, blunt, tipped with yellow. Schell Creek Mountains, Nevada, July, 1891.

ASTRAGALUS KENTROPHYTA Gray. It is hard to believe that a subalpine plant in the Wasatch can be the same as one growing on the driest slopes of valleys in the arid regions, but so far I can see no distinguishing characters. The floral characters of the arid plant are these: calyx bent like Hedeoma; banner arched less than 90° abruptly and with a hump below the bend also, cucullate, sides very concave and little reflexed; sulcus very shallow; banner contracted about a line below the tip, so that the general outline is oblong, tip abruptly reflexed or not at all, deeply notched, a little broader at tip than below, finely striate veined with purple; wings connivent, oblong-ovate, obtuse or barely acute, 1½ lines longer than keel, ascending; keel purple tipped, sharp, and much incurved. Very dry knolls in valleys of Eastern Nevada, fruit in July.

In my last "Notes" in ZOE I inadvertently transposed the terms dorsal and ventral in describing my species of *Astragalus*.

CERCOCARPUS LEDIFOLIUS Nutt. In a former communication in ZOE I gave some general details of the relation of the type to the variety *intricatus* Jones. Having now examined minutely all my material from all sources and also that in the Shaw Botanic Gardens (the Engelmann collection), my conclusions are that there is but one good variety of *C. ledifolius* and that one is the var. *intricatus*, which does not deserve higher rank. *C. parvifolius* Nutt. var. *breviflorus* Jones. I reduce from the *C. breviflorus* Gray, Pl. Wright 2 p. 54. It is clearly a form of the more robust species. *C. fothergilloides* HBK. is quite variable, and some forms are hard to separate from *C. parvifolius*. I studied this latter carefully in the Sierra Mojada in May, 1892 (Mexico).

The following are some notes on *C. ledifolius* and its variety. The species sheds its leaves late in the second season.

July 2, Muncy, Nev. Leaves lanceolate to linear, margins revolute, nearly glabrous, bark dark gray.

November 19,.Tintic, Utah. 7,000 feet altitude, leaves old, lanceolate, short woolly on both sides, typical form.

June 12, 1891, Dutch Mountain, Utah. Typical form; leaves broadly lanceolate, not revolute, large, glabrous on both sides, or nearly so below, petiole 2 to 3 lines long, calyx white woolly and tips with a tuft of wool.

July 8, 1891, Ruby Hill, Eastern Nevada, 8,500 feet altitude. Leaves lanceolate, glabrous on both sides, slightly revolute, calyx and tips pubescent only with very short wool.

June 20, 1892, Mt. Ibapah. Leaves broadly lanceolate, slightly pubescent, not white beneath, varnished, slightly revolute.

June 23, 1892, Mt. Ibapah, Western Utah. Leaves oblanceolate to lance-oblong, glabrous on both sides, calyx pubescent.

June 23, 1892, Spring Creek, Eastern Nevada, altitude about 7,000 feet. Leaves, older ones, linear lanceolate, 3 lines wide, scarcely revolute, upper surface nearly glabrous, lower white with very short and dense wool; other leaves on the same plant linear and revolute; anthers nearly orbicular and emarginate above and below.

Specimens No. 2, same locality. Leaves not revolute, lanceolate, an inch long, very woolly on both sides.

August 30, 1891, Moab, Southeastern Utah. Leaves glabrous and varnished, linear and cylindric, 3 to 8 lines long, ½ to 1 line wide; young branches short woolly. This is like Watson's type of *intricatus*, but with smaller leaves approaching the extreme form, with varnished minute leaves, collected by Coville in Southwestern Nevada.

June 9, 1891, Furber, Eastern Nevada. Tails of fruit 3 inches long, short plumose to within ½ inch of the tip, where they are bare; leaves linear-oblong, revolute or not revolute, very woolly or hairy on both sides. The length of the tails is determined by the weather. If it is dry they are very short and abortive; if wet, they are long.

May 20, 1891, Desert Mountains, Utah. Leaves 3 to 6 lines long, ½ to 1 line wide, varnished, cylindrical, densely fascicled.

May 16, 1891, Homansville, Utah. Leaves linear to lance-linear, glabrous or short villous, old leaves less revolute; flowers pubescent, plants less densely branched.

July 2, 1891, Muncy, Nevada. Broadest leaves 3 lines wide and 6 to 12 long, glabrous; narrowest, on the same plant, a line wide; bark darker than usual.

June 19, 1891, Clifton, Western Utah. Leaves 6 lines long, 1

line wide, linear, older ones glabrous and varnished, edges revolute nearly to midrib, and so nearly cylindrical, very abruptly acute; petiole ½ line long; leaves fascicled at the ends of branchlets; intricately branched; bark white throughout, or nearly so. Others from the same place have the leaves 4 lines long, narrowly elliptical, nearly glabrous, and the under surface not chalky white, as is usual in the type.

June 9, 1891, Furber, Eastern Nevada. Branchlets more slender; leaves less crowded, 2 to 6 lines long, younger ones white silky villous, and both sides alike, narrowly oblong, blunt, some scarcely revolute; tails an inch long, the upper half bare, plumose part with hairs 2 lines long and densely white, the hairs gradually growing shorter to the beardless tip. This latter is the case in all forms; calyx 3 lines long.

Specimens No. 2. Leaves very short-woolly, chalky white below, some scarcely revolute; calyx 4 lines long; otherwise as the above.

Specimens No. 3. Leaves densely white woolly, oblong linear, 3 to 4 lines long, 1 to 2 wide, broadest not revolute.

There are many other forms, but those given show the general trend. The variety is usually a densely and intricately branched shrub, 3 to 5 feet high, with light gray bark, abounding in rocky ravines and cliffs and rocky hillsides, forming a large part of the brush of the low mountains. It abounds below 7,000 feet altitude, but rarely grows much higher. The type begins at about 7,000 feet altitude, and runs up to subalpine on the higher mountains. On Ruby Hill, at 9,000 feet altitude, I saw the type matted like the firs near timber line on the loftiest mountains. Both the type and the variety are very much affected by the soil and moisture where they grow. The variety seems to be a form of the type that has adapted itself to conditions that the type, from its larger surface of leaves, cannot do. It is strange that Watson never saw this plant in Nevada, where he spent a season, and where it is very common. It was doubtless an oversight, as he also reported that he did not see *Juniperus Californicus* var. *Utahensis* (as it is now called) in Utah, while it is the only tree on Antelope Island, and the island is black with it, and was when he was there camping. It is also found everywhere in Utah.

RIBES CEREUM Dougl. The flowers have a cannon-shaped calyx; petals white, rounded at tip; calyx tips reflexed; fruit yellowish red

and woolly, as well as glutinous. It is occasional in Western Utah and Eastern Nevada.

ŒNOTHERA JOHNSONI Parry Am. Nat. 9, p. 270. This very poorly described plant is said to have elongated stigmas, petals an inch long, calyx tube not shorter than the leaves, capsules 9 to 12 lines long, somewhat 4-angled, strongly nerved, not crested, and to resemble *Œ. primiveris*, and to be very common at St. George, Southern Utah. The species which I have collected abundantly in Western Utah and Eastern Nevada is perennial, cæspitose from a many-branched root, which is covered at the summit with the dead petioles of former leaves, acaulescent or stems an inch or two long; leaves lanceolate, gradually decurrent into the petiole, which is 1 to 3 inches long, and never more than ½ the length of the blade; blade entire or undulate, or irregularly and sparsely dentate with sharp teeth; whole plant hoary with a dense, soft, and very short pubescence; calyx tips free in the bud; calyx splitting on one side and reflexed in flower, lobes 1 to 1½ inches long, tube 3 to 5 inches long and erect, with 8 striæ; petals rhomboidal, entire or slightly lacerate on the edge; 2 to 3 inches wide, and 2 to 2½ long, golden yellow, palmately veined with 3 very prominent and several intermediate veins, each feather veined in addition; the petals, in drying and fading, turn red, and resemble the meshes in the web of a frog's foot; stamens ½ line wide and 6 lines long, versatile, yellow; stigma lobes 4 to 6 lines long, ¼ line wide; capsule ovate, broadly winged, not nerved or veined, less than an inch long, not crested, hoary white; calyx also with scattered, fine, long, white hairs.

This grows on sunny southern slopes in very dry places, blossoms in June, and is by far the handsomest species of the genus. It is vespertine. Rather common in Western Utah and Eastern Nevada at 6,000 feet altitude. Should it prove to be new, I name it *Œnothera Howardi*, after Mr. A. M. Howard, the gentleman in my party who saw it first.

ECHINOCACTUS PAPYRACANTHUS Eng. The flowers are an inch long, opening but little; stigma cleft a line deep into 6 anther-like divisions, papillose on the sides and upper surface; filaments 6 lines long; style almost as long as the petals, ½ a line thick, linear; the flowers open in the morning, and close in the afternoon, but apparently are not affected by cloudy weather. This grows in alkaline soil, and blooms in May. It is scarce everywhere.

ECHINOCACTUS SIMPSONI Eng. Should be called *Mamillaria Simpsoni*, as all its relatives are there, and it differs in but one respect from that genus, *i. e.*, having the flowers just a little above the base of the tubercle. It blooms in daylight, and closes partly at night. Rather common at high altitudes, *i. e.*, above 7,000 feet. La Sal Mountains, Eastern Utah, and through the Territory and into Nevada. June.

ECHINOCACTUS WHIPPLEI Eng. This opens in the forenoon, and closes partly between 5 and 6 P. M. It also opens in the daytime if put in a dark place. It blooms in June, inhabiting the alkaline valleys and gravelly slopes. Occasional in Western Utah and Eastern Nevada.

OPUNTIA RUTILA Nutt. This is not distinct from *O. Missouriensis*. The flowers close partly at night, and in rain probably. Common. It blooms in May and June.

CYMOPTERUS CORRUGATUS Jones. This is not the type, but is the plant referred by Watson to *C. Fendleri*, and by Coulter and Rose to *corrugatus*. I could not get it with mature fruit. Involucre none; involucels broadly oval and scarious, or lanceolate and green, acute; fruit broadly winged; flowers white. Clayey hillsides near the Sevier River, Utah, below Juab. June, 1880. I doubt that it belongs to either species.

CYMOTERUS IBAPENSIS n. sp. Flowers white, in a head an inch wide; root large and long, thick and fleshy, erect, usually branched at summit, leafless but densely covered with what appear to be old leaf petioles; from amid these the scape arises and is 2 inches long in flower, its summit bears a tuft of many leaves; scapes in fruit 6 inches long or less; peduncles in flower shorter than the leaves, lengthening in fruit to 4 inches; leafless, striate, erect in flower and erect or decumbent in fruit; leaves fleshy and on drying finely wrinkled and so appearing to be finely pubescent, but glabrous, 3 inches long, ternate with the divisions pinnate to bipinnate, ultimate segments obtuse, either obovate and less than a line long or linear-spatulate and 2 lines long; base of petioles of the outer leaves much enlarged, nerved and sheathing, the rest less so; petioles not over an inch long, nerved; umbel of 6 to 8 rays, scarcely perceptible in flower, ½ inch long in fruit and stout; involucre none; involucels

of a few linear, acute, fleshy, not scarious scales, 2 to 3 lines long, distinct to the base; pedicels in fruit 2 lines long, filiform; flowers 5 to 8 from each ray; fruit 2 to 2½ lines long, broadly oblong truncate at each end, face concave only, about ⅓ of a circle, less than a line wide; oil tubes 3 between the ribs and 6 on the commissure; lateral wings a line wide, dorsal ⅓ less, all thick and corky for the size of the fruit. It is a close congener of *C. longipes* but differs in the size and division of the leaves, white flowers, small and simply concave fruit, and habitat. It is found only on clayey alkaline soil in the centers of the valleys. The fruit face is that of *C. montanus*. Deep Creek Valley, 5,000 feet altitude, June, 1891. A feature of the flowers that is more or less common to all the genus is in the petals, which are triangular lanceolate from a broad base, thick, deeply sulcate, barely acute, with incurved apex, so that the tip touches the disk between the contiguous edges of the petals; anthers black purple, reniform cordate, lying on the recurved filament next the edges of the petals like seeds in a five-celled pod, just bursting forth; they are very pretty; the filament straightens and thrusts the anther ½ a line beyond the petal; it then bursts; style not exserted at first.

CYMOPTERUS LONGIPES Watson. This plant is acaulescent at first and the yellow flowers are sessile in a rosette of green leaves, then the flower stalk lengthens always, is erect, and, after blooming, droops till the fruit is pendent, then as the fruit ripens the stem (peduncle) usually becomes erect again. The scape usually lengthens also, but not always. Abundant in the Wasatch and less common westward.

OROGENIA LINEARIFOLIA Watson. The Indians are fond of the raw bulbs. The flowers are white and the peduncles decumbent. This is one of the very earliest bloomers, and, though common, is seldom seen, as the plant is hardly visible when in fruit and even that disappears in a few weeks with the leaves.

TOWNSENDIA SCAPIGERA Eaton. The flowers open between 9 and 10 in the morning and close between 5 and 6 in the afternoon. It is frequent.

I think that Gray has confounded two well-marked species of *Bigelovia* in his cosmopolitan *B. graveolens*. One has a thyrsiform inflorescence, cylindric campanulate corolla with reflexed or widely

spreading lobes a line long, and usually glabrous stems and leaves; it grows 1 to 3 feet high. This is the *B. graveolens* Gray, really (Nutt). The other species is what should be called *B. nauseosa* (Pursh) and is the *Linosyris albicaulis* T. & G. This is also *B. graveolens* var. *albicaulis* Gray, and will include as varieties of it var. *latisquama* (Gray) and var. *hololeuca* (Gray). The type has a fusiform corolla, lobes almost never spreading and never reflexed, usually closed, often short; corymbiform inflorescence, usually flat topped with many heads, occasionally corymbs with few heads and somewhat thyrsiform in outline; stems white tomentose. The corolla is generally with closed lobes and then the fusiform character is very evident; it is always a little contracted at throat. The "cobwebby hairs" are found on all forms of the *B. graveolens* of Gray and are of no value.

Biglovia albida Jones. This name was not one of my choosing, but was insisted upon by Dr. Gray, who would not believe that I was correct in saying that the flowers were white. I have again had an opportunity to study this plant growing and find that the flowers are pearly white, the dirty white color of the dried specimens is due to the viscid matter of the heads coloring the flowers. The plant is 1½ to 2½ feet high, grows in clumps like the others, but more open; it is densely fastigiately branched at the top. It is found only on alkaline soil in the valleys and grows alongside of *Sarcobatus vermiculatis*. It is locally abundant on the eastern side of the Deep Creek Mountains, also in Spring, Antelope, and Steptoe Valleys, in Western Utah and Eastern Nevada.

Helianthella argophylla (Eaton) Gray. This botanical nomad, which has been successively called *Tithonia argophylla*, *Encelia argophylla*, *Encelia nudicaulis*, *Helianthella nudicaulis*, and now rests under the above name as the proper one, is cæspitose from a deep woody root, 1 to 1½ feet high (the peduncles); hoary with a dense, soft, and very short pubescence; old leaves silvery white, from nearly reniform to ovate, always with a cuneate base, and with a very long and margined petiole, 3 nerved, cauline none, or a rudiment, or occasionally there is a normal leaf at the base of the peduncle, blade 2 inches wide (usually), and an inch long, obtuse and entire; leaves very many and crowded at the root; petioles 5 inches or less long; bracts lanceolate acuminate from a broad base, either

like the leaves or softly tomentose in pubescence, in several series, not recurved, widely spreading in fruit because of the expanded head, which is hemispherical in fruit, not surpassing the disk flowers, obtuse; heads an inch broad and ½ an inch high, nodding in fruit usually; flowers nearly golden yellow; rays about 20, 2 inches long, and ½ inch wide or smaller, narrowly elliptical; minutely 5 toothed at the apex, neutral, usually with two loblets, one near the base of the ligule, and the other near the base of the blade; these lobelets are 3 to 8 lines long, and either green or yellowish; disk flowers urceolate-cylindric, 3 lines long, a line wide; proper tube a line long, very narrow, glandular; lobes reflexed, short, and hispid at tip; style tips bluntly triangular; ovaries nearly linear and slightly widened at tip, white silky with chaff-like hairs; margin hyaline and very hairy; apex with two scale-like awns equaling the short tube; ovaries 4 lines long exclusive of the awn, and flat; mature akenes obovate cuneate, and truncate to narrowly cuneate, black, with white callus margin, which is long villous; body of akene parsely hairy; pappus awns present or absent; crown entire or lacerate, ½ a line high or almost wanting. The leaves are thick and the whole plant so nearly simulates *Balsamorhiza sagittata* that I have no doubt it is quite common where that plant has been supposed to be abundant. It is sometimes found growing near it also. It abounds in Western Utah and Eastern Nevada on sunny and dry hillsides, on the southern slopes, in bare places, from 6,000 feet altitude down. It is abundant at Detroit, Dugway, and Gold Hill, Western Utah, and at Furber, Glencoe, etc., in Eastern Nevada, and doubtless abounds throughout Nevada and Southern Utah. My large and varied material and my field studies make it certain that the two species *argophylla* and *nudicaulis* are identical, and the older name must prevail.

BALSAMORHIZA SAGITTATA Hooker. The horses seem to like the leaves, as I noticed my animals eating it with evident relish. It is frequent throughout the Great Basin region.

TETRADYMIA GLABRATA Gray. The spines of all the species arise from the bark. In this, the "spineless" species, they are present and formed like the other spiny species, but they are so weak and narrow the same year they are formed that they are called spine-tipped leaves, and as they fall at the end of the season they are not dignified with the name of spines. In *T. Nuttallii* T. & G. the spines persist till the second year and then fall.

ARTEMESIA TRIDENTATA Pursh. This is considered a sure remedy for pneumonia, being taken internally, and also a poultice made of it and applied to the chest. One of my men was taken violently sick with mountain fever, his temperature going up to 104° and remaining there; when other remedies failed, I gave him a large quantity of the cold infusion of the leaves, which cured him in a few days.

MALACOTHRIX TORREYI Gray. The flowers close at night.

CREPIS OCCIDENTALIS Nutt. The flowers close at night.

LYGODESMIA SPINOSA Gray. This plant it seems to me has been wrongly referred to this genus; it is a better *Stephanomeria;* in habit it closely resembles the perennial species and also *Chætadelphia,* which is hardly distinct. In some specimens recently sent me from Idaho by Mrs. Brodhead I found the upper $\frac{1}{5}$ of the pappus was long plumose like *Stephanomeria* in many cases, while the rest of the pappus was strongly barbellate. The pappus is stout at base and differs from *Stephanomeria* in being multisetose only.

PRIMULA BRODHEADÆ n. sp. 2 to 4 inches high; 1 to 4 flowered; scape 2 to 4 inches long; leaves 1 to 4 inches long, narrowly elliptical, rounded at apex, glabrous, rather thick, smooth, entire, narrowed at base to a winged petiole an inch or less long; flowers purple, about 5 lines wide, lobes orbicular or nearly so, notched, with a very short claw 2 lines long, tube exceeding the calyx by 2 lines; funnel form above the calyx; calyx lobes 1½ lines long and subulate lanceolate, barely acute, equaling the tube of the calyx; pod nearly spherical; pedicels of lateral flowers about a line long, the terminal one 2 to 6 lines long; bracts oblong to ovate lanceolate, entire or toothed at apex, 1 to 6 lines long; base of plant covered with the dead sheaths of former leaves; roots like those of *P. Parryi.* Marshy places at Ketchum, Idaho, May to early June, altitude 6,000 feet. The perfume at first is rather strong and sweet. Dedicated to Mrs. Brodhead, the collector.

Var. MINOR n. var. Leaves an inch long or less, elliptical oblanceolate and acute, thin; lobes of the corolla as large as the type, but obovate; lobes of the calyx longer than the tube; flowers 1 to 2 on the scape; bracts long; plant 2 inches high. Bayhorse, Idaho, July 1, at 8,000 feet altitude, in marshy places. This is between *P. Parryi* and *P. nivalis,* Ledeb, but if the characters given in the Synoptical Flora are good this is a new species. I suppose this species is

the same as var. *Wilcoxiana*, Wood of *P. Parryi*, but I do not know that that was ever characterized in print.

GILIA PUNGENS Benth. is vespertine. I watched it on June 19, 1891, and found that the flowers opened after dark and closed at 7:30 o'clock A. M. I noticed the same thing in *G. Watsoni* Gray, and have no doubt that the same is true of *G. Californica* also. The flowers of *G. inconspicua* and *G. leptomeria* I have never seen fully opened except in sunny weather.

TRICARDIA WATSONI Gray I have found again in two places on Dutch Mountain, Western Utah. It is very rare.

ZYGADENUS PANICULATUS Watson is regarded as a good remedy for felon. The root is baked and applied to the sore.

EPHEDRA NEVADENSIS Watson is regarded as a cure for canker in the mouth and for diarrhœa. It will also produce the piles. The virtues seem to lie almost entirely in the pitch, which, when broken up, is a fine yellow powder and very powerful.

JUNIPERUS CALIFORNICUS Carr. var. UTAHENSIS, Eng. I saw this growing on the top of the Champlin Mountains, Utah, at 7,700 feet altitude, and all matted down and flat-topped, like *Abies fallax* and other conifers above timber line on our highest mountains.

PINUS MONOPHYLLA Torrey. This is very interesting in its young state. Until it is about 5 years old it is scarcely distinguishable from *Abies*. The primary leaves are an inch long, flat, and sharp. After that they grow shorter and little buds begin to appear in their axils; as these develop the leaves dry up and fall off, and there is a complete transition from the fully developed primary leaf to the minute bracts that subtend the young secondary leaves. Generally there are one or two cylindrical leaves scattered along the young stems and with their normal sheaths, while all around them are the primary leaves. I find that the leaves of *P. monophylla* are much more robust and vigorous than those of the variety *edulis* Jones, and so it is far more likely that *edulis* was derived from this than that *monophylla* was derived from it, as it can in no sense be considered a "depauperate form of *edulis*;" in addition, the cones are generally more robust and better developed, though there is an endless series of all sizes and shapes dependent upon the weather in August when the cones are growing. I find that the formation of seeds in the Western conifers, of our region at least, is due to the weather in August. If it

is rainy in that month, as is seldom the case, then the trees fruit abundantly, but if it is dry they seed but little or not at all.

INDICATIVE PLANTS.

Occasionally we are regaled with accounts of these plants, and one poor species after another is put forth as an infallible index of mineral. *Amorpha canescens* has recently been called the "lead plant," and it is stated that it indicates the presence of lead. If that be true, then the whole State of Iowa, especially the prairie portion, is a vast lead field. Unfortunately there is but little lead known in Iowa as a whole. *Eriogonum ovalifolium* is also made to do service for silver and arsenic in Montana. In Utah it is seldom found near silver mines, and when it so happens that they exist as low as the region that the plant frequents, then it is no more abundant there than it is over thousands of square miles that have no mineral. The plant abounds in all our valleys, and the color is either white or pink, and I dare say that arsenic has nothing to do with the coloring; it is far more likely that it is due to iron, which may or may not be near mines.

UTAH NAMES OF LOCALITIES.

In almost all the monographs and books giving localities of Utah plants the antique spelling of King's Report is adhered to. Isn't it about time that those relics are given a decent burial? They were invented by some enthusiast in Indian dialects who felt it necessary to put an "h" on every broad "a," whether it belonged there or not. Southern Utah is still groaning under the burden of the outlandish names applied to well-known and previously better named valleys, plateaus and mountains. It is no excuse for these that the names were given by the U. S. Geological Survey, for it has no right to change well-known names for those of its own creation. Some new names for well-known ones are as follows; Kaibab Plateau for Buckskin Mountains, Tushar Mountains for Beaver Mountains, House Range for Swazy Mountains, Wheeler's Peak for Jeff. Davis Peak, Toang Mountains for Toano Range, Mt. Emmons for Star Peak; among the outlandish names applied are Kaiparowits Plateau, Paunsagunt Plateau, Markagunt Plateau, etc.

Two of the bad spellings that I see most frequently in our botanical books are "Wahsatch" for Wasatch, the latter the correct one, and "Uintah" Mountains for Uinta Mountains. Coulter's Manual

errs on the former at all times, also all of Gray's and Watson's publications, and the monographers.

[I had supposed that I had made it sufficiently clear that I was the author of the var. *breviflorus* of *Cercocarpus parvifolius* Nutt. in the original paragraph in which it was printed, but it seems that there is at least one person who has not clearly understood it, so I will say again that the var. is to be credited to me alone.]

NOTES ON THE OCCURRENCE OF THE PUMA (*Felis concolor* L.) IN SOUTHERN NEW MEXICO.

BY C. H. TYLER TOWNSEND.

[Read before the New Mexico Society for the Advancement of Science, Dec. 1, 1892.]

A recent paper by Mr. F. W. True, in the report of the U. S. National Museum for 1888–89 (pp. 591–608, with plate XCIV), on the puma, or American lion, prompts me to record some available notes on the distribution of this animal in Southern New Mexico, since there seem to be no recorded instances of its occurrence in this part of the country.

The only case which I can personally vouch for is the following: While camped at the base of the Organ Mountains, at the northeastern end of the range, in the latter part of November, 1891, I saw a puma one morning about 8 o'clock disappearing over a ridge of rocks. He had emerged from the high and thick growth of *Yucca angustifolia* which covers the San Augustine plains at this point, and had disappeared before I could get a shot at him. One of the members of our party had passed within a few yards of a yucca, behind which he was crouching at the time, but without seeing him. He was apparently about three and one-half feet long, not including tail, and was of a yellowish gray color. Subsequent search among the rocks failed to show any trace of him. The same morning about three miles west of this place some Mexican goat herders reported that three tigers (*tigres*) had crossed the road at about eleven o'clock, going toward the mountains. This locality is about twenty miles east of Las Cruces, in Doña Ana County.

The following case was given me by Mr. W. E. Baker: In April, 1891, while driving toward Fort Stanton, in Lincoln County, on the

upper road, at a point less than three miles from and to the south of the fort, just after sundown, a puma was seen to spring up from the side of the road, a short distance ahead of the team. This point was not far from a draw containing timber. A shot was fired, which probably grazed the animal's back, for with a low yelp he made off down the wooded draw. The animal was estimated to be about three feet long, not including tail, and probably two and one-half feet high, and was doubtless not fully grown. He was of a tawny yellow color. This locality is on the U. S. Military Reservation at Fort Stanton, in Lincoln County. Some persons who came into Fort Stanton a day or two later on the lower road, reported seeing a puma the following night after the above one was seen. The lower road is about a mile west of the upper one at this point, running more or less parallel to it, and the wooded draw above mentioned connects the two roads. This was perhaps the same animal, therefore, that was fired at the night before.

The puma is not rare in Soledad Cañon, in the Organ Mountains, as the following cases will show: Mr. Jeff Isaacs, who has a ranch in the cañon, has killed twelve of these animals within the past four years. They have caused serious depredations among his lambs and colts. He tells me that they have killed five colts for him, and also numbers of calves and sheep. The skin of one which he killed with a pistol, in the fall of 1889, measured nine feet from end of nose to tip of tail. This measurement is vouched for by Mr. W. R. Fall, of this place. The cañon is a little south of east of Las Cruces, Mr. Isaac's place being about twenty miles from here.

Mr. Fall also tells me that Mr. G. R. Beasley, who has a ranch a mile or two beyond (east of) Isaac's ranch in Soledad, killed a puma in June, 1892, and says that there are several of these animals now alive in that vicinity.

In regard to the occurrence of the puma on the Upper and Lower Penasco, in western Lincoln County, Mr. S. E. Kennedy, of this place and formerly of Tularosa, vouches for the following: The skin of a puma killed by a man named Newman, near the head of the Penasco Creek, in the fall of 1891, measured eleven feet and some inches (three inches?) to tip of tail. Mr. Kennedy vouches for this measurement, which he made himself. This skin, therefore, is the longest one on record, the measurement of which is reliably vouched

for. I am unable, however, to give the length of the body and tail separately. The skin was measured in a straight line, and was of course somewhat stretched. The scalp was left on. The fur was of a tawny yellow color. Mr. Kennedy says that the puma is often met with on the Penasco, and states that the above-named Mr. Newman and a Mr. Wm. York have killed a great many in that region, the skins having been shipped by Mr. Kennedy to St. Louis, where they rarely brought more than $1.00 apiece. The average length of the skins, Mr. Kennedy states, is from seven to eight feet to tip of tail; but he asserts that he has received two or three which were over eleven feet long.

The government offers a bounty of $5.00 on the puma in this territory, and therefore the skins brought in usually lack the scalp.

NOTES ON FERTILIZATION.

BY ALICE J. MERRITT.

TRICHOSTEMA LANCEOLATUM Benth. The tube of the corolla is so bent back upon itself as to pretty effectually exclude small insects that could otherwise enter. Ants small enough to pass through the tube, were it not for the troublesome corner, are often seen upon the plants; but, though many flowers were examined to determine the method of fertilization, only one minute insect was found which had succeeded in reaching the nectar. The dusty color of the foliage renders this plant inconspicuous to a marked degree, but the bees seem to find it readily, aided doubtless by the strong odor, which probably warns grazing animals of its disagreeable taste. The bee whose visits were watched is an Anthophora. As it alights on the lower lip, its weight instantly straightens the tube, and brings the long curved stamens and pistil against its back with sufficient force to discharge much pollen. A bee too small to be struck by the stamens would have too short a tongue to reach the nectar. The anthers shed their pollen before the stigma matures, so that the bee, in passing from the younger flowers near the top of the stem to the more mature flowers at the bottom of the next cluster, is sure to effect cross fertilization. It is uncertain whether the stigmas mature soon enough to be fertilized by their own pollen should cross fertilization fail.

ZAUSCHNERIA CALIFORNICA Presl. The flowers have an oblique position, with stamens and style close against the lower petals and sepals. After the anthers begin to discharge their pollen, the style lengthens until it is from ¼ to ½ inch beyond them before it unfolds its four lobes and exposes the rough, sticky, stigmatic surface. The pollen is collected in little balls of a few grains each, and these balls are held loosely together and to the anthers by cobwebby hairs. The calyx tube is much constricted above the nectar. The humming birds are frequent visitors to these brilliant flowers, and they can hardly fail to carry pollen on their throats or breasts. I have watched Zauschneria when there were throngs of bees frequenting less showy flowers near by and have seen but one bee visit it. Probably the shape of the flower prevents them from getting the nectar. Its little bronze green visitor, however, seems small enough to reach the constriction, and has, perhaps, a tongue sufficiently long to go through to the nectar, after emerging from the tube. This bee invariably paused on the lower margin of the flower, and seemed to be cleaning its antennæ. In this process some pollen usually became attached to its legs and abdomen and might sometimes adhere to the stigma of another flower. This, however, was not observed. Zauschneria seems to have some chance for close fertilization. Of course, if the pollen simply fell, it would strike the under side of the stigma lobes, not the stigmatic surface; but it usually remains attached to the anthers for some time after the stigma is exposed, and the little masses sometimes swing down on their gossamer threads so far that the slightest jar would send them against their own stigma. During a morning's walk three flowers were seen that had been fertilized in rather a novel way. A seed of the plant, with its tuft of hairs, had been blown against a pollen mass with sufficient force to land it all on the stigma.

BIOLOGICAL NOTES ON PHAINOPEPLA NITENS.

BY F. E. BLAISDELL.

The Phainopepla is a conspicuous summer resident in the western part of San Diego County, where it is admired for its black, glossy plumage, airy and graceful flight. Even within this region of its distribution there are some localities where it is rarely seen, and this is no doubt due to the absence of its food plants and scarcity of trees.

As a general thing it is rarely observed near the coast, except along the San Diego and Sweetwater Rivers, where willows, cottonwood and oak trees are abundant, and the adjacent hills covered with shrub oak, sumachs, buckthorn, and sage. Rarely seen on the mesas about San Diego and other regions where *Adenostoma fasciculatum*, *A. sparsifolium*, *Hosackia glabra*, *Rhus ovata*, *R. integrifolia* constitute the main flora. With the increased planting of orchards in these localities it is becoming more common.

It is occasionally observed at Coronado since the planting of the avenues with *Eucalyptus*, *Cupressus macrocarpa*, *Olea Europæa*, *Abies excelsa*, *Schinus molle*, *Ficus carica*, *Grevillea robusta*, *Citrus* and palms, but I have never observed it nesting there. In favorable localities it is common and breeds.

Among children and those not conversant with ornithology it is known by the following names:—

Black Crested Flycatcher, Black Mocking Bird, Mountain Phœbe, and Red Eyes.

The Phainopepla arrives at Poway about the first of May, the males usually arriving several days before the females. They are rarely seen after the middle of August.

Poway Valley is situated twenty miles northeast of San Diego, fourteen miles from the seacoast, and thirty miles distant from the edge of the coniferous belt, with an elevation of 700 feet.

The principal plants of this region are: *Quercus dumosa*, *Q. agrifolia*, *Platanus racemosus*, *Populus Wislizeni*,* *Alnus oblongifolia*,* species of *Salix*, *Rhus laurina*, *Rhamnus crocea*, *Prunus demissa*,* *Sambucus glauca*, *Ceanothus sorediatus*,* *Adenostoma sparsifolium*, *A. fasciculatum*, *Artemisia Californica*, *Opuntia occidentalis*, *O. prolifera*.

Shortly after arrival the male selects a site for a nest and proceeds to its construction, which may be completed before the female arrives, but if not she assists. Late arrivals commence labor together. The mates make alternate trips to and from the nest in search of building material, one remaining upon the slowly growing nest, arranging the last accession and pressing it into place; as the returning mate approaches, they exchange a purring salutation and exchange places. The nests are placed at varying distances from the

*But sparsely distributed.

ground, from four to even fifty feet. The materials used are prickly or viscid. The fruit and leaves of some of the members of the Borage family have the preference, together with the leaves and down of species of *Gnaphalium*, all being bound together by spiders' web; the interior of the nest is thinly lined with bits of wool, hair, and down. When completed the nest is fragile, and not sufficient to support the rapidly growing young, and if not placed on a good support, is very liable to give way, and endanger its inmates to the perils of a fall.

The eggs are two (frequently), three (usually), or four (rarely), in number. The mates take turns in the act of incubation. The young are abundantly fed on the berries of *Rhamnus crocea*, *Rhus laurina*, and near to and within the coniferous belt upon the fruit of *Rhamnus Californica*. When disturbed the young birds disgorge the ingesta. The food of the adults consists of berries and insects, and they are beneficial rather than injurious about orchards.

MARIPOSA COUNTY AS A BOTANICAL DISTRICT.

IV.

BY J. W. CONGDON.

THE SUBALPINE REGION.

We have now reached that portion of our county which forms in summer by far its most pleasant and beautiful region. It consists of several uneven plateaus lying between the higher ridges of the mountains and also includes the tops of the lower ridges. While the sides of the mountains up to the limit of tree growth and much of the more level ground are covered with heavy timber, there are, along the water courses, many large open natural meadows where the luxuriant grass, mingled with numberless flowers of varied and beautiful hues, form in this State almost our only representatives of the luxuriant meadows of the east.

The altitude of this region varies from 4,000 to 8,500 feet, thus including all the lower and wooded mountains, and it extends up the higher ones to the upper limit of trees, which is usually about 8,000 feet or a little more.

This tract is pierced by two deep valleys,—the Yosemite and Wawona Valleys, occupied respectively by the main Merced River and the South Fork. The vegetation of these valleys, the floor of which lies from 2,000 to 4,000 feet below the subalpine region proper, consequently includes a larger proportion of plants which belong lower down; but these lower levels are too narrow, and the cliffs that border them and furnish the life-giving supplies of water are so lofty and so full of subalpine vegetation themselves, that they furnish the great majority of the species and control the general character of the vegetation. Hence, in these articles, these great valleys will be considered in connection with the great plateaus through which they cut their deep and narrow channels.

The trees of this region include all or nearly all of those belonging to the coniferous belt. Mingled with these are found the splendid red fir of the Sierras (*Abies magnifica* Murr.); the Jeffrey or black pine (*Pinus Jeffreyi* Murr.); and the tamarack pine (*Pinus murrayana*, Murr., *P. contorta* var. Bot. Cal.) In the upper part of this region the mountain white pine (*Pinus monticola* Dougl.) and the mountain spruce (*Tsuga Pattoniana* Engelm.) become common, while in the Big Tree Grove, south of the South Fork, the huge Sequoias (*S. gigantea* Decaisne) occupy a limited space, fortunately preserved from the spoliation of the lumbermen.

The less heavy and continuous forest, the more open country, and the greater variety of soil and exposure, combine to produce a much more abundant and varied vegetation, while the neighborhood of the loftier summits and the abundance of water prevent the excessive heat and horrible dryness which, in the foothills, makes life in the summer a burden and outdoor activity during the greater part of the day terribly exhausting and often positively dangerous.

These circumstances tend to make this whole region the most delightful and healthful summer resort in our State. While the stupendous scenery and the pleasant climate of the Yosemite are a perpetual feast to the lingering as well as the transient visitor, the other portions of this region, though they may not boast such grand scenery, yet have compensating advantages which make them even more attractive to the seekers for health and rest who desire to make a longer and more leisurely stay than the ordinary tourist. For such of these who prefer or are compelled to limit themselves to

established routes and demand the luxurious accommodations of the modern summer resort, Wawona offers a really pleasanter summer home than the valley itself, under present conditions. But for those seeking pleasure or science who find it agreeable for a while at least to escape the burdens as well as the luxuries of our pampered civilization and enjoy a brief season in the solitary woods and mountains, this furnishes the best possible opportunity for the gratification of their desires. The high plateaus adjacent to Mt. Raymond and the Big Trees, the great divide between the south fork and the main Merced River, over which the Glacier Point Turnpike passes, and still more the region north of the Yosemite, including Lake Tenaya and extending out of the county to the Soda Springs of the Tuolumne, offer to camping parties of the right kind the most delightful opportunities for a stay of weeks or even months. In this last locality they are brought within easy access of all the high mountains in that quarter. Cathedral Peak and Mts. Conness, Dana, Lyell, Gibbs and others form the ramparts of a vast amphitheater, and are easily within the reach of those ambitious of high ascents, while all may enjoy the beautiful and exhilarating climate and other manifold attractions which make life here delightful. Nearly the whole of this region is within the limits of the national park, a circumstance which by wholly excluding the vast bands of sheep that formerly devoured almost every green thing and denuded the natural meadows of every vestige of grass, has made it more accessible to visitors, since there is abundance of forage for the requisite animals and the surface of the country itself is far more luxuriant and beautiful.

Coming now to a more particular description of the flora of this subalpine region, we refer the reader to former articles for the many species which, occurring first in the coniferous belt, extend into and often become more abundant in this,as well as for the few which, beginning below the coniferous belt, ascend above its limits.

In the following list Y, as heretofore, indicates a plane of the Yosemite Valley. W. indicates one of the Wawona valley, and M. G. one chiefly found in the Mariposa grove of big trees, while the other abbreviations also have the same meaning as before.

Thalictrum occidentale Gray. Borders of meadows.

sparsiflorum Turcz. Banks of streams, 7,000 feet and above.

Ranunculus Flammula L. var. reptans Meyer. Y. & C.
alismæfolius Geyer. Crescent Lake.
occidentalis Nutt. var. tenellus Gray. W.
Caltha biflora DC. Crescent Lake. A.
Aquilegia cærulea James. Y. Cultivated from native specimens.
Delphinium decorum F. & M. var. patens Gray. Crescent Lake.
Andersonii Gray. Upper Yosemite Creek.
scopulorum Gray, var. glaucum Gray. Buck Camp, 7,000 feet.
Aconitum Columbianum Nutt. Buck Camp. Upper Yosemite Creek.
Draba stenoloba Ledeb. Y. (Bot. Cal.)
crassifolia Graham. Peregoy's.
Arabis platysperma Gray. Dry slopes, 6,000 to 7,000 feet.
repanda Wats. Y. W.
Holboellii Hornem. Y.
Erysimum asperum DC. var. pumilum Wats. Crescent Lake.
Sisymbrium incisum Engelm. Cloud's Rest.
Nasturtium sinuatum Nutt. Y. W.
Subularia aquatica L. Crescent Lake.
Viola blanda Willd. Y. Crescent Lake.
glabella Nutt. Occasional, 6,000 feet.
Stellaria crispa C. & S. Y. Cliffs, etc.
umbellata Turcz. Buck Camp.
longipes Goldie. Everywhere.
Jamesii Torr. Y. Frequent below 7,500 feet.
Arenaria capillaris Poir. Glacier Lake.
Calandrinia pygmæa Gray. A. Buck Camp, 7,500 feet and above.
Claytonia Chamissonis Esch. Frequent at 6,000 feet and above.
triphylla Wats. Frequent at 6,000 feet and above.
Spraguea umbellata Torr. Sandy soil but rare below 6,000 feet
Linum digynum Gray. Yosemite Trail (Bot. Cal.)
Geranium Richardsoni F. & M. Buck Camp.
incisum Nutt. Y. W. etc.
Ceanothus prostratus Benth. Rocks at about 6,000 feet.
Acer glabrum Torr. Yosemite cliffs.

Lupinus ornatus Dougl. Crescent Lake.
sericeus Pursh. Mts. Buena Vista and Surprise, 8,000 feet.
confertus Kell. Glacier Point Turnpike, etc. Y.
Andersoni var. Grayi Wats. W.
parviflorus Nutt. Y.
laxiflorus Dougl. Inspiration Point, etc.
minimus Dougl. Lake Tenaya.
Breweri Gray. Above Yosemite 7,000 feet. Crescent Lake.
Trifolium longipes Nutt. Peregoy's, etc.
Bolanderi Gray. Peregoy's, etc.
monanthum Gray. W. Glacier Point Turnpike.
Hosackia Torreyi Gray. W. 5,000 feet.
Astragalus Bolanderi Gray. South of Yosemite. 7,000 feet.
Spiræa betulifolia Pallas. Y., etc.
discolor Pursh. var. dumosa Wats. 7,000 feet.
Geum macrophyllum Willd. Y. W.
Fragaria Virginiana Ehr. var. Illinoensis Gray. Y.
Potentilla gracilis Dougl. var. rigida Wats. Y.
Grayi Wats. Peregoy's. Base of Mt. Hoffman, 7,000 feet.
gelida C. A. Meyer. Crescent Lake.
Horkelia fusca Lindl. Y. and above.
tridentata Torr. Y. W.
Ivesia unguiculata Gray. Y. (Bot. Cal.)
santolinoides Gray. South of Yosemite. 7,000 feet.
Pyrus occidentalis Wats. Crescent Lake, etc. 7,000 feet.
Saxifraga occidentalis Wats. Yosemite Cliffs.
bryophora Gray. Foot of Mt. Surprise, 7,500 feet.
Boykinia major Gray. Y. M. G.
Bolandra Californica Gray. Yosemite Cliffs.
Tellima tenella Walp. Yosemite Cliffs.
Mitella Breweri Gray. Peregoy's, etc., 7,500 feet.
Heuchera rubescens Torr. Yosemite Cliffs.
Parnassia palustris L. var. Californica Gray. Meadows. (Bot. Cal.)
Ribes oxyacanthoides L. Lake Tenaya.
lacustre Poir var. molle Gray. Lake Tenaya.
cereum Dougl. South of Yosemite.
viscosissimum Pursh. Yosemite Cliffs

Epilobium spicatum Lam. W., etc. 5,000 and 6,000 feet.
Watsoni Barbey. Cloud's Rest.
alpinum L. Summit Chowchilla Mountain, etc.
origanifolium Lam. Same region as last. A.
brevistylum Barbey.? W.
glaberrimum Barbey. Common at 5,000 and 6,000 feet.
Gayophytum racemosum T. & G. Frequent.
pumilum Wats. Signal Pk.
Sanicula Nevadensis Wats. 5,000 feet.
Carum Howellii C. & R. W. Snow Creek. 3,300 feet.
Eulophus (Podosciadium) Bolanderi C. & R. Yosemite Cliffs, etc.
Ligusticum apiifolium B. & H. Y. (Bot. Cal.)
Grayi C. & R. Crescent Lake, etc., 7,000 feet.
Cymopterus terebinthinus T. & G. Y., etc.
Garrya Fremontii Torr. Yosemite Cliffs, etc.
Lonicera conjugialis Kell. Glacier Point, Crescent Lake. 7,000 feet.
cærulea L. Crescent Lake
Kellogia galioides Torr. W. Frequent at 5,000 and 6,000 feet.
Galium bifolium Wats. Peregoy's, etc. 7,000 feet.
pubens Gray. Y. W. 5,000 feet.
Valeriana sylvatica Banks. Y. and above. A.
Eupatorium occidentale Hook. Mt. Buena Vista. Yosemite Cliffs. A.
Brickellia grandiflora Nutt. Y.
Chrysopsis Breweri Gray. Woods, 6,000 to 8,000 feet.
Aplopappus Whitneyi Gray. Wooded slopes, 7,000 feet.
cuneatus Gray Rocks. Y. & C. 6,000 feet.
Bloomeri Gray. South of Yosemite. 7,000 feet.
Aster campestris Nutt var. Bloomeri Gray. Lake Tenaya.
adscendens Lindl. Y. Crescent Lake, etc.
integrifolius Nutt. Crescent Lake, etc. 7,500 feet.
occidentalis Nutt. Y. and W. Common, 5,000 feet.
Fremonti Gray. Yosemite region.
Andersoni Gray. South of Yosemite. Abundant on shores of subalpine lakes, 7,000 feet and above.
Erigeron salsuginosus Gray. Yosemite Cliffs. Crescent Lake. 7,500 feet.
Breweri Gray. W. Y. Below 6,000 feet.

Antennaria dioica Gaertn. Yosemite Cliffs, Crescent Lake, etc.
Rudbeckia Californica Gray. M. G.
Wyethia mollis Gray. Y. and above Lake Tenaya.
Madia Bolanderi Gray. M. G.
Hemizonella minima Gray. Above Yosemite. (Bot. Cal.)
Whitneya dealbata Gray. M. G., etc., 6,000 feet.
Hulsea brevifolia Gray. Y. and above.
Chænactis Douglasii H. & A. W. Y., etc.
Artemisia tridentata Nutt. Y.
Rothrockii Gray. Crescent Lake. A.
Senecio lugens Richardson. Crescent Lake, etc.
triangularis Hook. M. G. Common at 5,000 to 6,000 feet.
Arnica cordifolia Hook. Yosemite Cliffs.
Chamissonis Less. Yosemite Cliffs.
viscosa Gray. Base Cloud's Rest.
Phalacroseris Bolanderi Gray. South of Yosemite. 7,000 feet.
Stephanomeria lactucina Gray. M. G.
Crepis acuminata Nutt. Buck Camp. 7,500 feet. A.
Troximon Nuttallii Gray. Base Cloud's Rest.
Hieracium horridum Fries. (Breweri Gray.) 7,500 feet above Yosemite.
albiflorum Hook var. flavum. Nevada Falls trail.
Vaccinium myrtillus L. Crescent Lake.
var. microphyllum Hook. Same.
occidentale Gray. South of Yosemite. 7,500 feet.
Arctostaphylos Nevadensis Gray. Not rare at 7,000 feet.
Leucothöe Davisiæ Torr. Signal Pk. 6,000 feet.
Kalmia glauca L. Crescent Lake, etc. 7,500 feet.
Ledum glandulosum Nutt. Chihuahua Creek. 6,500 feet.
Pyrola secunda Ait. Occasional above 7,000 feet.
Sarcodes sanguinea Torr. W. Common at 5,000 to 7,000 feet in the woods.
Pleuricospora fimbriolata Gray. M. G., etc.
Gentiana Amarella L. var. acuta Hook. Above Yosemite. (Bot. Cal.)
simplex Gray. South of Yosemite, 7,000 feet.
Newberryi Gray. Slopes of Mt. Buena Vista, 8,000 feet.
Frasera speciosa Dougl. Glacier Point.

Menyanthes trifoliata L. Crescent Lake.
Phlox Douglasii Hook. Above Yosemite, etc. 7,000 feet. A.
Gilia tenella Gray. South of Yosemite. (Bot. Cal.)
pungens Benth. Y.
aggregata Spreng. Above Yosemite, etc. 7,000 feet.
leptomeria Gray. Goose Lake. 6,500 feet.
Polemonium humile Willd. South of Yosemite. 7,000 feet.
Phacelia hydrophylloides Torr. Occasional at 6,000 feet.
pusilla Torr. Lake Tenaya.
Hesperochiron Californicus Wats. Peregoy's.
Mertensia Sibirica Don. Common at 6,500 feet, etc.
Echinospermum diffusum Lehm. South of Yosemite. 7,000 feet.
floribundum Lehm. Same region.
Collinsia Torreyi Gray. Y. Common below 7,000 feet.
Penstemon Menziesii Hook. Y.
confertus Dougl. Y. Also A. in dwarf form.
lætus Gray. Y. and above.
Mimulus leptaleus Gray. Glacier Point, Turnpike, etc. 6,000 feet.
Torreyi Gray. Not rare at 4,000 to 5,000 feet.
Lewisii Pursh. Chihuahua Creek, etc. 7,000 feet.
laciniatus Gray. Y. W.
rubellus Gray. Peregoy's.
n. sp. Glacier Point Turnpike.
mephiticus Greene. Glacier Point. Lake Tenaya. A.
primuloides Benth. Y. & C. 5,000 to 6,000 feet.
Veronica alpina L. Crescent Lake. 7,500 feet.
Castilleia affinis Hook & Arn. Y. Crescent Lake, etc.
Lemmoni Gray. Lake Tenaya.
Orthocarpus lacerus Benth. Y. and above.
Pedicularis Grœnlandica Retz. Lake Tenaya.
attollens Gray. Crescent Lake.
semibarbata Gray. Forests at 5,000 feet.
Utricularia vulgaris L. Y.
Rumex paucifolius Nutt. Little Yosemite, Lake Tenaya.

Polygonum minimum Wats. Lake Tenaya.
ramosissimum Michx. Y.
tenue Michx. Y. and above.
Bidwelliæ Wats. Crescent Lake.
Bistorta. L. Y. and above.
polymorphum Ledeb. Glacier Point, Lake Tenaya.
Eriogonum stellatum Benth. Crescent Lake.
Torreyanum Gray. Crescent Lake.
incanum T. & G. Nevada Falls trail. 7,000 feet. A.
marifolium T. & G. Nevada Falls trail. 7,000 feet. A.
spergulinum Gray. Peregoy's, etc. 7,000 feet. A.
Wrightii Torr. Chihuahua Falls. 6,000 feet.
Myrica Hartwegi Wats. Banks of Big Creek. 5,000 feet.
Salix Sitchensis Sanson. Glacier Point Turnpike.
Lemmoni Bebb. Not rare at 4,000 and 5,000 feet.
Californica Bebb. Crescent Lake.
Populus trichocarpa T. & G. Y.
Castanopsis chrysophylla. A. DC. W., etc. 5,000 to 6,000 feet.
Phoradendron Bolleanum Eichl. Signal Pk., etc., on Abies concolor.
Juniperinum Engelm. Common on Libocedrus at 5,000 feet.
Arceuthobium Americanum Nutt. Little Yosemite on Pinus Murrayana.
Juniperus occidentalis Hook. Nevada Falls. Lake Tenaya.
Sequoia gigantea Decaisne. M. G.
Abies magnifica Murr. Glacier Point, etc. 7,000 feet.
Tsuga Pattoniana Engelm.
Pinus monticola Dougl. Not rare at 7,000 and 8,000 feet. A.
Jeffreyi Murr. Glacier Pt., etc. 6,000 to 7,000 feet.
Murrayana Balf. Y. and more common above 7,000 feet.
Habenaria leucostachys Wats. Brooks at 5,000 to 7,000 feet.
sparsiflora Wats. Summit Mt. Chowchilla, 6,500 feet.
hyperborea R. Br. Crescent Lake.
Goodyera Menziesii Lindl. Pine forests at 4,500 to 6,000 feet.
Epipactis gigantea Dougl. Chihuahua Creek. 6,000 feet.
Cypripedium montanum Dougl. W. Y.
Iris longipetala Herb. Y.

Sisyrinchium Californicum Ait.
Allium validum Wats. Buck Camp, Lake Tenaya. 7,500 feet.
Sanbornii Wood. Y. (Bot. Cal.)
bisceptrum Wats. Crescent Lake, etc.
tribracteatum Torr. Glacier Lake.
Camassia Leichtlinii Wats. Meadows, Glacier Pt. Turnpike.
Lilium parvum Kell. Y. and above.
Veratrum Californicum Durand. W. Crescent Lake.
Zygadenus venenosus Wats. Y. and above.
Sparganium simplex Huds. Crescent Lake, etc.
Potamogeton Claytonii Tuck. Y. (Bot. Cal.)
natans L. Crescent Lake.
Luzula spadicea DC. var. melanocarpa Meyer. Not rare at 6,000 feet and above.
divaricata Wats. Base of Mt. Hoffman.
Juncus Drummondii Meyer. Crescent Lake, etc. 7,000 feet. A.
Nevadensis Wats. Crescent Lake, etc. 7,000 feet. A.
oxymeris Engelm. W. M. G.
phæocephalus Engelm. Not rare, 5,000 feet and above.
obtusatus Engelm. Big Creek, 5,000 feet.
chlorocephalus Engelm. Y. Tenaya trail.
Scirpus carinatus Gray. Y.
sylvaticus L. var. digynus Bœckl. Buck Camp.
criniger Gray. Lake Tenaya.
Hemicarpha occidentalis Gray. Sandy beds of Merced and South Fork.
Eleocharis obtusa Schultes. Y.
Fimbristylis capillaris Gray. Y.
Carex filifolia Nutt. Nevada Falls trail, Lake Tenaya. 7,000 feet. A.
Douglasii Boott. Y. (Bot. Cal.)
Hoodii Boott. Y. (Bot. Cal.)
illita Bailey. Y. and above.
specifica Bailey. Yosemite region.
straminea Schk. var. congesta Boott. A. Above 7,000 feet.
athrostachya Olney. Y.
tenuirostris Olney. Lake Tenaya.
canescens. L. W., (Bot. Cal.)

Carex echinata Murr. Above 4,500 feet.
scoparia Schk. var. fulva W. Boott. Above 5,000 feet.
adusta Boott. W. and above.
quadrifida Bailey. Lake Tenaya.
Raynoldsii Dewey. Lake Tenaya.
globosa Boott. Yosemite Cliffs, etc.
amplifolia Boott. W.
Yosemitana Bailey. Y.
Whitneyi Olney. Y.
Sartwelliana Olney. Y.
luzulæfolia Boott. Crescent Lake.
fulva Good var. Hornschuchiana Boott. Y.
lanuginosa Boott. Yosemite region. W.
trichocarpa Muhl var. imberbis Gray. Royal Arch Lake.
vesicaria L. Y.
utriculata Boott. Royal Arch Lake.
Phleum alpinum L. Glacier Point. Meadows, etc., 7,000 feet. A.
Sporobolus depauperatus Scrib. Y.
gracillimus Vasey. Y. and above.
Agrostis æquivalvis Trin. M. G. (Bot. Cal.)
exarata Trin. Frequent above 4,500 feet. A.
varians Trin.? Mt. Buena Vista. A.
elata Trin. Y.
scabra Willd. Everywhere above 4,000 feet.
Cinna arundinacea L. Royal Arch Lake, etc.
Muhlenbergia gracilis Trin. Y. (Bot. Cal.) Lake Tenaya.
Vaseya comata Thurb. Y. and above.
Deyeuxia Canadensis Beauv. Royal Arch Lake.
Langsdorffii Kunth. Crescent Lake, etc., 7,000 feet.
stricta Trin. Yosemite region.
Stipa occidentalis Thurb. Frequent above 7,000 feet. A.
Kingii Boland. Lake Tenaya.
Danthonia sericea Nutt. Yosemite trail. (Bot. Cal.)
Trisetum subspicatum Beauv. Frequent. A. Above 7,000 feet.
var. molle Gray. Frequent. A. Above 7,000 feet.
Deschampsia cæspitosa Beauv. Crescent Lake. Lake Tenaya. A.

Melica stricta Boland. Yosemite Cliffs.
fugax Boland. Frequent above 6,000 feet.
Glyceria fluitans. R. Br. Y.
nervata Trin. Frequent above 4,000 feet.
pauciflora Presl. W., etc.
Agropyrum violaceum Lange. Upper slopes of the mountains. A.
Cheilanthes Californica Mett. Y.
Pellæa Breweri Eaton. Yosemite Cliffs.
densa Hook. Yosemite Cliffs.
Bridgesii Hook. Yosemite Cliffs.
Cryptogramme acrostichoides. R. Br. Yosemite Cliffs. Mountain slopes.
Aspidium Nevadense Eaton.

These species, 295 in number, of which only 21 are certainly known to extend above to the proper alpine heights, taken with the 39 species in common with the plains and lower foothills, and the 75 species which reach here from the coniferous belt, make a total of 409 native species, which constitute the entire proper flora of the district. Scarcely a trace of the naturalized plants of the lower regions here appears except in the cultivated grounds at Wawona and in the Yosemite, and no attempt is here made to take any account of them nor of some common plants that are limited to the cultivated fields and meadows in both valleys, and are as much introduced plants where they are found as the recognized weeds that grow with them.

NOTES ON OTTERS.

BY SAM HUBBARD, JR.

SEA OTTER (*Enhydris lutris*).

The coast of Washington from Gray's Harbor north to Cape Flattery is the only part of the United States in which the sea otter is now hunted outside of Alaska. This interesting and valuable fur bearer, unlike its cousin, the land otter, lives in the ocean, and is rarely known to come ashore. A full-grown sea otter is about as large as a setter dog, with a thick, chunky head, and a mouth full of formidable looking teeth. It has short fore legs, not over six or

eight inches long, terminating in soft, round paws, while instead of having hind legs like a land otter it has seal-like flippers, but unlike the seal the otter has a round tail about a foot long, covered with beautiful fur.

In color otters vary somewhat. The young are a rich brown; from this they change, in the adult animal, into a deep, glossy black, the more valuable skins being sprinkled with long white hairs, giving that silver-gray appearance which is so much prized. As they grow older the white hairs predominate, so that some of the largest skins will be grizzled gray all over, lighter on the belly and darker on the back. The skin is very loose, lying almost in folds, so that from an animal but little over three feet in length comes a skin which easily stretches to six feet and over. The fur is very thick and beautiful, and nearly an inch long, and has no full covering of thick, coarse hair, as in the case of beaver and land otter skins.

Mr. Damon, who lives on Damon's Point, which is the north spit at the entrance of Gray's Harbor, once caught a young otter which had wandered into the bay and become stranded on a sand spit near his house. He brought the little fellow home, provided him with a tub of water, and gave him all the care possible, but during the night he escaped from the tub and was found dead in the morning.

I also saw a cub that was killed by the Indians at the Quinault Reservation. It was brown all over, and the skin was worth about fifteen dollars.

Their principal food consists of clams and crabs, but they doubtless catch some fish also. They obtain their food by diving for it right in the edge of the surf, and it seems as though the heavier the breakers the more they enjoy the sport. When they catch crabs (which seem to form their principal diet), they come to the surface of the water, and, floating on their backs, place the crabs on their breasts and proceed to tear them to pieces with their short fore paws. The Indians also claim that they carry their young in the same manner. Many of the larger skins have a worn spot on the breast owing to its constant use as a table.

There are some large beds of kelp a few miles off the coast, and on these the young are born, usually two in number. Owing to the fact of these animals living all the year round in the cold waters of the North Pacific, the fur seems to be just as good in the summer as it is in the winter.

They are hunted by both white men and Indians, who shoot them with heavy rifles especially manufactured for long-range purposes. This is probably the most difficult rifle shooting in the world, the successful hunter requiring extraordinary skill and vast patience, plentifully sprinkled with good luck. In the first place the otter is very shy, and all shooting is done at from two to six hundred yards. Then the otter merely shows his head and a small portion of his hips, which makes a very small mark at that distance. Again he rarely approaches shore except in rough weather, so that he is always bobbing up and down on the big rollers, and usually with a high wind blowing. With all these difficulties to contend with it is no wonder that several hundred shots are fired to each otter obtained, and also that from two to four otters are considered a good year's work. The price of skins on the beach ranges from $50 to $250 each according to size and quality, the average being somewhere near $125. Twenty or thirty years ago the otters were much more plentiful than at present, bands of several hundred being seen at a time, and in those days the hunter would get as many in a month as he now gets in a year, but at the same time the price of the skins was about half what it is at present.

When the white men first began to make a business of hunting otter in the palmy days of old, when they were plentiful, they selected spruce trees which stood conveniently close to the water, and constructed platforms in them about twenty or thirty feet from the ground. From these elevated stages they could overlook the surf and discern their game much more readily than from the beach. As the otters became wilder and kept farther away, the necessity for something better presented itself, so they constructed what are known as derricks, made of three long poles set up like a tripod and surmounted on top by a small wooden box open at the top and one side. These derricks are set up on the beach about half way between high and low water, the box, or crow's nest, standing about twenty feet above the sand.

The hunter enters this as the tide is coming in, so that at high water he is on an elevated perch right in the midst of the breakers. He is kept a prisoner there, however, until the tide recedes sufficiently to allow him to go ashore. If he is fortunate enough to kill an otter he makes a note of the condition of the tide, the force and

direction of the wind, the drift of the current, etc. Then he patrols the beach in the direction in which the otter is liable to come ashore, and patiently waits for it to come in. This sometimes takes two days, but they all of them come ashore sooner or later. He also tells his comrades, who likewise watch the beach, and they always respect each other's property. When hunters were more numerous than they are at present they used to brand their bullets as an additional means of identification.

In the summer season when the weather is settled the Indians of the Quinault Reservation venture out into the ocean in their canoes and attack the otter out at sea. The white hunters object strongly to this method of hunting, as they claim it makes the otters even wilder than they are at present. Undoubtedly many otters are hit that get away badly wounded. This is particularly the case when pursued by the Indians in their canoes. They are not as good shots as the white hunters, and then they often find bands of otter and shoot indiscriminately into the bunch.

Probably the most successful white hunter on the beach is a man named Wetherell, who has hunted there a long time and has killed a great many otters. About half way between Gray's Harbor and the Quinault River is the Copalis Rock, which stands in the ocean some 600 yards from the beach. This rock has very precipitous sides and its summit is perhaps forty feet above the water on a calm day, but when there is a storm the great rollers come in and dash themselves against this bold sentinel until the spray runs in snowy cascades down his grim sides and the shock of the impact makes him tremble to the very foundation. On this wild spot Wetherell determined to build a house and shoot sea otter—and he did it.

The rock can only be approached in calm weather, so with the aid of some Indians and their canoes he carried lumber out there and built a small hut on the highest point of the rock and securely bolted it down. He carried out food and water and here he used to stay, sometimes kept prisoner for three or four weeks at a time, but enjoying magnificent opportunities to shoot otters as they swam by. He established a code of signals and also had a blackboard on which he used to write the direction a dead otter was drifting. This was read by means of a glass by his confederates on shore, who picked them up as they drifted in. This was a very successful stand for a

long time, until they shot there so much that the otters became alarmed and have ever since given the rock a wide berth. The otters have other enemies as well as man. This was demonstrated to my satisfaction by finding on the beach a dead one that had been killed at sea. It had several long cuts in the skin and a great bruise as though it had been bitten by some large animal. The otter hunters said that it had probably been attacked by a shark or a sea lion while lying asleep on the water. The otter probably had strength enough to escape from its assailant, but finally succumbed to its wounds. There was a peculiar crease on one of the hind flippers, which, on skinning, proved to be an old bullet wound, as small pieces of lead were found imbedded in the bone.

The otter was quite fat and perfectly fresh when found. The fur was glossy black, changing to dark brown underneath. The skin was bought by a trader and fur buyer, who paid $65 for it.

NORTH AMERICAN OTTER (*Lutra canadensis*).

Quinault Lake is in that forest wilderness that borders the Pacific Ocean in the extreme western part of the great State of Washington.

The lake is about fifty miles north of Gray's Harbor and some thirty miles east of the ocean, and is drained by a fine river of the same name, timbered along its shores by firs, hemlocks and cedars.

It is only within the last five years that this interesting country has been explored by white men, consequently wild animals are still tolerably abundant and may occasionally be seen in their native fastnesses.

One beautiful evening in August I sat in my canoe about a quarter of a mile down the river from the lake and just above the first rapid. The shadows had grown quite long, the millers and caddis flies had come out of their leafy retreats and were flying over the stream, while the eager trout were breaking water and exposing their silvery sides with a recklessness that made my fisherman's heart beat stronger. The last fly had been fastened on the leader and I had just seized the pole to push into the stream when some animals on the opposite side of the river caught my eye. The first thought that flashed through my mind was muskrats. No, they are too active for muskrats; then they must be mink; too large for mink: they were otters. What a good time they were having too!

Fortunately the rifle was in the canoe, so I paddled quietly across

the stream, being careful to keep above them. The wind was blowing up stream from them towards me, so they did not scent me and appeared entirely unsuspicious.

I was now within fifty yards of them; so as quietly as possible I laid down the paddle and, picking up the rifle, let the boat drift. The current carried me rapidly toward the otters and I was just about to shoot when the canoe quietly grounded on a submerged rock and hung poised in mid stream. I was now within thirty yards of the game and had an unobstructed view of all their movements.

There were six of them in all, four pups and two adults. They were diving for fish and each one that went down came up with a trout in his mouth. He would then gulp him down without going ashore, and at once dive for another. Their heads sticking above the water, their mouths wide open, with the white of their lips and gums showing, reminded me of a lot of rubber tubes.

There was a moss-covered root sticking out of the water near by, and every now and then a couple of the pups would climb out on this and chase each other and play like two kittens.

While I watched them they caught six or eight trout from four to six inches in length, bolting them down with evident relish.

All this time, however, the current was taking the older ones, who seemed to do most of the fishing, further down the stream. This was a reminder that it was time for me to take a hand in the game. I waited until two of the pups crawled out on the root, and drawing down as fine as possible on one of them I pressed the trigger.

Between those forest walls the roar of the gun sounded like a small cannon. For a few seconds there was a great splashing and commotion and then all was still. Not an otter was to be seen. I had apparently missed a dead shot. Impelled by a vicious shove from the setting pole, the canoe shot alongside the root, and there, struggling in the water behind it, was a fine young otter with a bullet hole through his head.

Otters sometimes follow down the streams of this region into tide water. An old trapper once showed me an otter slide on the muddy banks of the Hoquiam River not two miles from Gray's Harbor, the river at this point being a slough in which the tide ebbs and flows. The slide was very faintly indicated and I should never have known what it was if he had not pointed it out to me. Young otter are readily tamed and make most interesting and pretty pets.

THE EFFECT OF CLIMATE UPON PACIFIC COAST BIRDS.

BY L. BELDING.

It has been the custom of American ornithologists to refer to the birds of the damp forests on the coasts of Northern California, Oregon, Washington, and British Columbia as the "dark, northwest coast birds;" of the birds of the arid treeless areas east of the Cascade and Sierra Nevada Mountains, of the Mojave and Colorado deserts and Arizona, as the "bleached desert races;" of the resident peculiar forms of the Sacramento and San Joaquin valleys, as birds of the "dry, hot interior," thus referring to localized forms, which migrate little, if at all, and in the terms quoted, correctly conveying the idea that the environment or climate inhabited by these forms is the cause of their divergence from nearly related species and sub-species. A familiar axiom carrying the same idea is, "Migration holds species fast, localization lets them slip," the purport of which is that birds which migrate and are subject to many conditions are much less liable to change than those which do not migrate and are subject to few conditions. Whatever potency natural selection or sexual selection may have in causing differentiation—and their operation in this direction seems very obscure—here, where there is such variety of climate, soil, and vegetation, consequent upon difference in altitude and humidity, proximity to the ocean and removal from it, we may well consider climate as our most important factor in evolution.

Turning from birds to man, we see in our country, descendants of people of various European nationalities who bear the impress of our climate and the distinctive characteristics of Americans. Even the pure-blooded Jew, whose occupations and modes of living vary but little, is similarly affected, and I have noticed that the English Jew resembles, more or less, the Englishman, the German Jew the German, and I think the Polish Jew is different from any of these. It is difficult to see how selection could have had much influence in modifying the Jew.

The black man appears to be one of the natural products of Africa, the copper-colored man of America, but I would not venture to predict that the Caucasian and negro of America will in the dim future become copper colored, and that our vexatious race problem will in this way be solved, but I do venture to protest against giving the theory of selection undue prominence.

A NEW JUMPING SPIDER.

BY JOHN L. CURTIS.

The subject of the following description is a spider which has been carefully studied by the writer for some time past. It was recently submitted to Prof. G. W. Peckham, who has pronounced it a new species of the genus Dendryphantes. Accordingly, I have thought it timely to publish a short description of the spider, together with such notes on habits, etc., as I have collected. The following will, I think, sufficiently identify it.

DENDRYPHANTES ÆNEOLUS.

Total length, 5.4 mm.; width of abdomen, 2.2 mm.

Cephalothorax, length, 2.4 mm.; width, 2.2; height, 1.8 mm.

Legs, 8.3 mm., 5 mm, 4.6 mm., 6.2 mm. Patella and tibia of the first, 2.7 mm.; patella and tibia of 2d, 1.6 mm.; patella and tibia of 3d, 1.6 mm.; patella and tibia of the 4th, 2 mm.; metatarsus and tarsus of the 4th, 1.6 mm.

Total length, 6.7 mm.; width of abdomen, 2.6 mm.

Cephalothorax length, 2.6 mm.; width, 2 mm.; height, 1.6 mm.

Legs, 6.2 mm., 4.9 mm., 4.4 mm., 5.9 mm. Patella and tibia of 1st, 2 mm.; patella and tibia of 2d, 1.6 mm.; patella and tibia of 3d, 1.2 mm; patella and tibia of 4th, 1.8 mm.; metatarsus and tarsus of 4th, 1.7 mm.

♂♀ Cephalothorax moderately high, convex, a very little dilated behind dorsal eyes with sides nearly vertical in front and rounded behind, Ephalic part level, thoracic part falling rather abruptly. Quadrangle of eyes occupying one-third of cephalothorax, one-half wider than long, same width before and behind. First row of eyes bent, inclined slightly downward, middle eyes sub-touching, lateral about one-third as large as middle eyes and separated from them by one-fourth of their own diameter. Eyes of second row midway between dorsal and lateral eyes ♂, a little farther from dorsal than from lateral eyes ♀. Dorsal eyes a little smaller than lateral eyes, farther from each other than from lateral borders, forming a row as wide as the cephalothorax at that place. Clypeus perhaps inclined a little backwards, one-third as high as middle eyes in ♂, four-fifths as high as middle eyes in ♀. Falces wider than the two middle eyes, reaching to inner margins of lateral eyes, once and a half as long as face ♂♀, divergent, inclined slightly forward. Fang strong ♂, vertical, paral-

lel; fang weaker ♀. Maxillæ blunt, cut on inner margin toward labium. Labium a little longer than wide, more than one-half as long as maxillæ; sternum oval, three-fourths longer than wide, projecting between anterior coxæ. Anterior coxæ separated by a little more than the width of the labium, much larger and longer than the others, smaller and shorter in ♀ than in ♂. Legs of first pair much larger and longer than the others ♂, somewhat larger and longer than the others ♀. Femoral joints compressed and enlarged. A few spines on femur, patella, tibia and tarsus and metatarsus of first leg, all but the patella of second, third and fourth legs, in terminal ring on tarsus of third and fourth. In the first and second pairs the spines are most numerous on the inner side of the leg. A few femoral spines on the palpi.

COLORATION.

FEMALE.—Upper cephalothorax grayish-brown with slight bronze cast and a space of polished black posteriorly just in front of the abdominal juncture. Under side black with long white hairs sparse.

The background color of upper abdomen is black or deep brown, with a heavy bronze cast over all. Beginning at the spinnerets and extending about four-fifths of the abdominal length, are two narrow, black or deep brown bands. Between these bands anteriorly is a light, tawny-yellowish area divided centrally by a dark streak. More of this yellowish color is seen along outside the bands and on the forepart of the abdomen. There is a border of the same around the anterior rim. Upon each of the black bands are four spots of the same. Side abdomen light gray, under side same, darker along the median line.

MALE.—The upper cephalothorax is usually black or has the gray-brown color only in patches. The chief difference is in the upper abdomen, which has the same ground-color and bronze cast but no yellow markings except the anterior and side rim. The bands are obliterated, but often the posterior yellow spots remain.*

EXPLANATION OF MARKINGS.

The gray-brown color of the cephalothorax is due to short, stout, slightly iridescent yellow scale-hairs scattered over the black integu-

*The foregoing description was made with a lens of a power of four or five diameters. The following was made with a compound microscope of about fifty diameters.

ment. The side color is due to the same scales and the black line along the rim is due to the absence of them. The yellowish clypeus is caused partly by long hairs and partly by scales. In the male the coloring of the clypeus is not so clearly yellow because the hairs and scales are sparser. In the upper cephalothorax these yellowish scales are interspersed with other scale-hairs of like shape but of a grayish color and most brilliant iridescence, which are particularly numerous on the forepart and produce the bronze luster. In some, especially in young specimens, these scale-hairs are thick all over.

The skin color of the upper abdomen is deep brown or black, usually appearing brown to the eye but under the microscope black with long black hairs. The yellow markings are formed of hairs like those on the cephalothorax, while the longitudinal dark bands are simply parts of the dark integument set in relief by the yellow scale-hairs. The yellow along outside of bands is in natural females a close collection of these scales, but in gravid females it appears as a series of oblique, backward streaks, one from each of the dots on the bands. This indicates weak portions of the integument, which stretch to make room for the eggs. Bronze hairs also, like those on the cephalothorax, are thickly set between the bands posteriorly, outside the bands anteriorly, and on the forepart of the abdomen. Others are scattered among the yellow hairs. The yellow border in both sexes is composed in part of longer hairs than those forming the other markings. The dark upper abdomen of the male is due to the absence of yellow scale-hairs, although there are enough bronze scale-hairs to give it a luster. The under abdomen has the same black skin covered with nearly white scale-hairs of a smaller size than the yellow ones. They are not so thickly set along the middle and the skin shows through, forming the darker central band. Male legs dark brown with darker brown rings, as follows: Last half of femur dark brown with tip end lighter; last end of tibia gradually darker; light scale-hairs on all except first two joints. The second pair of legs have dark rings on patella, tibia and tarsus; metatarsus with a black tip; scales as in first pair; third and fourth pair same. Palpi light brown, last joint dark, dark hairs on last joints, light hairs on others; light yellow scales on femur and two succeeding joints; mouth-parts, coxæ and sternum dark brown; anterior coxæ darker than posterior; falces nearly black; fang red-brown.

Female, first and second leg of a uniform light-brown with a black tip, light and dark hairs, sparse scale-hairs on all except first two joints. Third and fourth legs same with tarsus and metatarsus lighter. Some have a narrow dark ring on tibia of the third and fourth pairs; others have a dark ring on patella, tibia, and tarsus of the same. Palpi light-brown with light hairs.

The markings of this spider often rub off, giving rise to individual differences.

This brilliant bit of a spider is quite common about San Francisco Bay, but has not yet been reported elsewhere. It is found on many plants, but in gardens where I have observed it most, it is more frequently seen on honeysuckle, rose bushes, live-oaks, and the shrub known as laurestina. The last two seem to offer peculiar advantages, for not only do the leaves lie closely together, but the oak leaves are curled and the laurestina leaves are quite often rolled lengthwise. Between two leaves in the one case, or within the rolled leaf in the other, the spider finds a safe retreat, while the dead live-oak leaves, where they lodge together in hollows, furnish spacious cavities between them for the web domiciles.

The domicile is a simple flat tube, open at both ends, with sometimes an open branch tube from the main one. The spider enters by inserting the fore legs between the sheets of webbing and holding them apart as it forces its way in. If there is danger of intruding foes, the spider holds the sheets together with the fore legs at the end most threatened.

The flat cocoon which contains the yellowish eggs is made within the tube, and the young ones share the parent domicile until after the second moult, when they depart on aeronautic tours of exploration for themselves.

The males and females appear as adults as early as April, but the former become rare after the first of June and the latter after the first of September. The females begin laying eggs in May. The number of cocoons made by a single female is not more than two, and probably, judging from captives, the general rule is to make but one. The eggs, about fifty in number, hatch on the average in about twenty-five days, and the young are found at all times of the year.

DENDRYPHANTES ÆNEOLUS is one of our so-called flying spiders, the young being especially given to that progressive method of loco-

motion. Often, when sitting in the garden, I have had one alight on my book, crawl to the top of my uplifted finger or pencil, and fly away on its web or make it a bridge to some other and usually higher point. The way of getting upon the breeze is in principle the same as with all other flyers. Arrived at the top of an elevation, the spider raises the spinnerets and emits a thread, which the wind is allowed to carry far enough to bear. If this is successful, it flies, but if the thread catches, it simply fastens it where it stands, draws it in, as it were hand over hand, until taut, and then crawls upon it to the other attachment. In most cases the fly-line flows from the posterior spinnerets, while from the anterior pair another thread is drawn, and fastened to the point upon which the insect stands, so that it has a returning line if the flying, at first successful, should afterward end in failure. If the fly-line catches, the extra line simply strengthens the first end of it, or affords return, should it break.

It can easily be seen that this way of traveling must be exceedingly advantageous to these spiders, not only because of the ease and speed which the web bridge allows, in crossing water, desert places, patches of grass or clover and other obstructed routes, but also because of the much greater speed and safety afforded by actual flight. With spiders, as with men, however, the easiest and speediest ways are most likely to be disastrous, as is shown in the following instance, which illustrates as well the instinctive endowment enabling this spider to overcome its natural enemies.

On a bright morning several years ago a pet lizard lay sunning himself on a table in the yard, when a partly grown specimen of this spider came sailing along and dropped down directly in front of him. For a second or two the spider, unconscious of the great impending danger, looked about in the seemingly intelligent way peculiar to Attidæ. The lizard, as yet sluggish and unawakened, was pushed toward it. Instantly the careless attitude of the spider was changed for the strategic; facing its enemy, it slowly, almost imperceptibly, drew in its legs until it looked more like a tiny chip or the top of a polished nail-head than like a spider. The saurian was then moved around behind; *æneolus*, with fixed eyes and cautious movements, turned to face him still. I put my fingers just behind the spider, but it chose to face the greater, and, from the spider standpoint, more imminent foe, and kept its eyes on the lizard. After testing in various ways without touching it, I now slightly pushed

the spider from behind with a pencil. With a sudden side jump and a rapid dash along beside the lizard, it crawled under his outstretched tail and dropped over the edge of the table into the grass. If the lizard had been lively, the spider would not have fared so well, but as it was, it not only escaped, but had more scope for showing its instinct. In the first place, instinct seemed to tell that lizards are dangerous animals. That is curious enough in itself. In the second place, it had learned, or secured by inheritance, the exact strategem which could save it from such enemies, if anything could. A lizard never devours an insect that does not very perceptibly move. A third conclusion that I drew was that the spider knew which was the most dangerous end of the reptile. At any rate, it ran under the tail, and, though in a decided hurry, seemed to feel safer out of range of the lizard's eyes than in running straight on to the other end of the table. Making due allowance for any imagination of mine on the last point, it must be conceded that such knowledge of lizard habits in a spider shows considerable intelligence.

NOTES ON HISTERIDÆ OBSERVED IN SAN DIEGO COUNTY.

BY F. E. BLAISDELL.

HOLOLEPTA. This genus is represented by six well-defined species, two of which I shall describe as new. The individuals of each, with two exceptions, are quite numerous in their season.

HOLOLEPTA YUCATECA Mars. Found in the decaying fruit of *Cucurbita*, *Echinocactus viridescens*, leaves and stalks of *Opuntia occidentalis*. The largest species of the genus, body greatly depressed, head extended, with long, prominent mandibles. Mentum flat, impunctate; prosternum narrowed, and rounded at tip; sides of body more or less arcuate. Rather plentiful from May to November.

HOLOLEPTA PERVALIDA sp. nov. Form strongly oblong, narrower and much less depressed than *yucateca;* sides parallel. Mentum nearly flat, strongly punctate laterally, rather sparsely so at middle; prosternum intermediate between the preceding species and

fossularis; mandibles rather strongly curved and shorter. Length 17.5 mm. Rare. Found in decaying *Echinocactus viridescens.*

HOLOLEPTA CACTI Lec. Very abundant in decaying cacti, frequently taken from beneath the bark of decaying and water-soaked wood of the willow. Mentum concave, with strongly elevated lines; prosternum narrowed and almost acute at tip.

HOLOLEPTA VICINA Lec. Common from July to November. Found in the decaying fruit of *Cucurbita.* Mentum concave without elevated lines; prosternum slightly narrowed, truncate, and slightly emarginate at tip.

HOLOLEPTA NEGLECTA sp. nov. Narrower and more elongate than *vicina.* Mentum feebly concave, lines rudimentary; prosternum slightly narrowed, subtruncate. Sides of prothorax quite evenly arcuate. Sides of body moderately arcuate. Length 7 mm. Found in decaying squashes. Rare. This species was identified for me as *lucida,* but is entirely different in habitat from specimens subsequently obtained of that species.

HOLOLEPTA POPULNEA Lec. Taken from decaying cacti in the eastern or desert portion of the county; common in Arizona.

HISTER SELLATUS Lec. Not common; in spring and early summer observed flying about sandy places near streams, also found about the roots of plants. Elytra are marked with red.

HISTER SEXSTRIATUS Lec. Common; observed flying about on warm days in spring, also found at the roots of grasses and beneath bark in rotten wood; a large black species.

HISTER MILITARIS Horn. In some seasons quite common. Frequents the sandy banks of streams, and beneath débris in same locality. Smaller species with each elytron marked with a red line.

TRIBALISTER MARGINELLUS Lec. Rare; taken from beneath rocks in moist places.

TRIBALUS CALIFORNICUS Horn. A very small species and abundant beneath bark, rocks, etc., in permanently moist places. I once observed some six or eight individuals feeding upon a living *Melanotus longulus.*

PAROMALUS OPUNTIÆ Lec. Common; found in decaying fruit of species of *Cucurbita,* leaves and stalks of *Opuntia occidentalis.*

PAROMALUS CONSORS Lec. Common; frequents decaying vegetable matter.

SAPRINUS OREGONENSIS Lec. Common about fetid vegetable and animal matter.

SAPRINUS LUBRICUS Lec. and S. FRIMBRIATUS Lec. Abundant everywhere, especially along the seashore about putrefying matter.

SAPRINUS CÆRULESCENS Lec. Quite common in summer about the dead bodies of snakes and small mammals.

SAPRINUS SULCIFRONS Lec. Common along the seashore beneath kelp.

VIEWS OF A WORKING BOTANIST ON THE NEW AMERICAN RULES OF NOMENCLATURE.

BY J. H. CONGDON.

Five of these rules are simply the practice of all good botanists concisely expressed, and need no comment. No. VIII will never be followed. It is simply an extravagant but logical extension of the principle so rigidly expressed in rule No. 1.

The sooner No. 4 falls into a state of innocuous desuetude, the better. It will certainly get there.

As for No. 1, in the rigid construction that will be claimed for it, it is a deliberate sacrifice of the rights of the great majority of us to the vagaries of individuals. Where all the botanists of a country have for a generation agreed on the use of certain names for the vegetation of their own country, and everyone has learned them and become familiar with them, we do not intend to suffer some old pamphlet to be dug up by some musing bookworm from some pile of forgotten rubbish in some back closet in some old library three thousand miles away, where some old pedant has given a vague description from some traveler's scrap of a plant which the author never saw growing and really knows nothing about, to make all the rest of us take up our botanical lists, which have become as familiar to us as our alphabet, and rub out the old names associated with years of study and observation in the field, and put in their miserable resuscitated antiquities. We shall do nothing of the kind. We shall stick to the old familiar words and leave the works of those that adopt these new-old names to repose in the antiquated dust from which they were dug.

SOME NOTES ON AZOLLA.

BY DOUGLAS HOUGHTON CAMPBELL.

One of the most interesting of the native Pteridophytes of California is the widely distributed *Azolla filiculoides*, occasionally called "water-fern." This pretty little plant is common in many localities, and when found at all, usually occurs in great numbers, and often covers extensive stretches of quiet water with a dense purple-red mantle so thick that the water is completely hidden. Sometimes, however, a pond that is completely covered with the plant, may, after a few months, show no trace of it beyond a few decaying fragments that have sunk to the bottom, or are entangled among the Lemna and other floating weeds on the surface. Whether this sudden disappearance is due simply to the plant's having completed its natural term of existence, or to some other cause, I am unable to say. A pond near the La Honda road, some dozen miles back of Palo Alto, was visited repeatedly between November 1891 and May 1892, and at all times was covered with a luxuriant growth of Azolla. The same pond visited in September, showed not a single living plant, although ripe spores were found in the decaying masses of plants at the bottom of the pond, and these germinated promptly when set free and placed in clear water. The pond has not been visited since, so I cannot say whether or not a new generation of plants has appeared.

The genus Azolla is a small one, but widely distributed. Of the four species usually recognized, two are American, viz.: *A. filiculoides* and *A. Caroliniana*; *A. nilotica* is African, and *A. pinnata* is Asiatic and Australasian. Both *A. filiculoides* and *A. Caroliniana* are attributed to California, but all specimens yet seen by me have belonged to the former species, and as these included some from the collection of the Academy of Sciences labeled *A. Caroliniana*, I have some doubts about this species occurring here. This is the species of the eastern part of the continent, where it is widely distributed and reaches as far south as Brazil. *A. filiculoides* occurs in Chile and Peru, and probably pretty much all along the Pacific Coast.

As the life history of all the species was very imperfectly known, an effort was made to clear up as far as possible the obscure points. To this end observations were begun in November, 1891, and continued, with more or less interruption, for a year. Only a few of the more important and general points brought out by these investi-

gations will be given here, as the details will be given in a somewhat extended paper that has just been completed.

The plants multiply very rapidly by the detachment of branches at the base, which become independent plants, and in this way the plant spreads with great rapidity when once established. Besides this method of multiplication, spores are formed which give rise to a new generation of plants.

The spores are of two kinds, large ones (macrospores), and small ones (microspores). The sporangea that contain these are borne in separate receptacles, which usually occur in pairs. These are borne on the lowest leaf of a branch, and an investigation of their earlier stages shows that they are metamorphosed leaf-segments. The ordinary leaves are divided almost to the base, into two lobes, and in the sporiferous leaves, one of these lobes is transformed into the rudiments of the sporocarps. This lobe is first divided into two equal parts by a median cell wall, and each half then grows by an apical cell to form the rudiments of the young sporocarp. At a very early stage a ring-like wall is formed around the base of each rudiment, and rapidly grows until it forms a cup, in which is contained the papilla-like sporangial receptacle. This cup finally closes at the top and thus forms the closed capsule in which the sporangia are borne. In the smaller sporocarps a single macrosporangium, which almost completely fills it, is formed, and this originates directly from the apical cell of the sporocarp-rudiment. The microsporangia are produced many together, and the sporocarps containing them are larger. The development of the two sorts of sporangia is at first much the same, and follows closely that of the ordinary ferns, so much so, indeed, as to leave no doubt that Azolla is closely related to them.

A comparison of the whole sporocarp with the sorus of certain ferns shows that its wall is really homologous with the indusium of the latter.

If we examine the earlier stages of the macrosporangium we cannot fail to be struck with its extraordinary resemblance to the young ovule of many phanerogams, and the form and position of the indusium suggest immediately its homology with the first integument of the ovule. This is not so surprising when we remember that the ovule is really nothing but a specially modified sporangium.

Up to a certain point the two kinds of sporangia develop alike, but a difference becomes evident just before the formation of the spores.

In the macrosporangium but eight spore mother cells are produced, while in the microsporangium there are sixteen. In both cases, each spore mother cell divides into four, in the usual way; but whereas all of these develop more or less perfectly in the microsporangium, only one comes to maturity in the macrosporangium, and develops into the single large spore that fills its cavity.

Shortly before maturity the protoplasmic matter filling the microsporangium separates into several masses (massulæ) each of which encloses a number of spores. The substance of the mature massulæ has a peculiar foamy appearance, and looks almost like a cellular tissue, but examination shows that it is only hardened protoplastic matter, and that the peculiar cellular appearance is caused by vacuoles in it. In stained sections of the nearly ripe sporangium, the nuclei of the disorganized tapetal cells can still be seen lying in the spaces between the massulæ, and are evidently concerned in the formation of the glochidia, curious anchor-like outgrowths of the massulæ.

In the macrosporangium the protoplasmic matter surrounding the spore is used to build up the curious epispore and appendages. The epispore in *Azolla filiculoides* is composed of a substance very similar to that of the massulæ. It is provided with prominent irregular knobs that have attached to them numerous fine threads. The upper part of the spore is crowned with three pear-shaped masses of the same substance as the epispore. The ripe macrospore fills the sporangium so completely, and the latter fits so closely into the indusium, that its wall is so compressed as to be only discernible after close scrutiny.

The sporangia are set free by the decay of the indusium, but this decay is only partial in the case of the macrosporangium, and the upper part of the indusium becomes hard and dark-colored, and persists as a little cap, covering the top of the spore, whose base finally becomes entirely free by the decay of the sporangium wall. As the massulæ escape from the microsporangium, by the complete disorganization of its wall, the glochidia stand out from them and by their hooked ends become fastened to the threads that cover the prominences on the surface of the macrospore, and often the massulæ are so numerous as to completely hide the lower part of the macrospore. This is obviously a great assistance in fertilization, as the germinating microspores are thus brought close to the macrospore.

In order to study the germination of the spores, sections must be

made, as the first stages take place within the completely closed spore. From the macrospore a small triangular prothallium is produced, which breaks open the apex of the spore, and pushes up between the three appendages on the top. A single archegonium is formed at a very early stage, in the center. This resembles in its essential features the archegonium of the ordinary ferns. In case the first archegonium is not fecundated, several others may be formed, but the growth of the prothallium is limited, and appears to cease after the reserve fund in the spore is used up. If the first archegonium is fertilized, the egg-cell after secreting a cellulose wall about itself divides by a transverse wall. From the upper of the two primary cells the stem and fine leaf of the young plant arise; from the lower, the primary root and the foot (the organ by which the embryo absorbs its nourishment from the spore).

The microspore produces an extremely simple prothallium bearing a single antheridium.

The ripe spores sink promptly when placed in clear water, but as the embryo develops, large intercellular spaces are formed, which, filling with gases, cause the young plant to rise to the surface.

The development of the prothallium, so far as could be determined, is completed in about one week from the beginning of germination; and it is almost as long before the young plant rises to the surface of the water. These figures are necessarily only approximate, as there is no means of telling how far germination has advanced without killing the plant, and there is a great deal of difference in the time when germination begins.

All species of Azolla have always associated with them a nostoc-like plant of the genus Anabæna. The necklace-like chains of cells of this plant are always found tangled about the growing point of the Azolla stem, and as the leaves develop, a cavity is formed in each one, into which the Anabæna filaments creep and form a colony. They do not seem to affect the growth of the Azolla, but are simply sheltered by it. As the sporocarps are forming, the Anabæna makes its way into the open top where the cells enter a resting condition to assume growth again when the spores germinate. When this takes place, the Anabæna filaments surround the growing point of the embryo, which is thus brought into contact with the parasite from the very first.

NOTES CONCERNING THE FLORA OF SONORA.

BY T. S. BRANDEGEE.

Early in May the writer landed at Guaymas, the seaport of the State of Sonora, Mexico. This month of the year is never a good one for observing the vegetation of the region, for the ground has completely lost the moisture acquired during the rainy season, and no new showers are to be expected immediately. The time of my visit was unusually unfavorable, for the rainfall of the preceding rainy season had been small, and the vegetation of a dry earth under a burning sun showed fewer signs of life than usual. The surface of the country about Guaymas is very much diversified and eminently suitable for a varied flora; the city itself is almost surrounded by high cliffs and steep hills; the large harbor contains many islands, some rocky and abrupt, some of a more gentle and rolling character, and some extending into long sand-spits, but slightly elevated above high tide. Its waters find their way into numerous small bays, situated behind ridges and extending to the openings of long cañons, all of which can easily be visited by obtaining the assistance of the clamorous boatmen. Any botanical collector who reaches this place is likely to be visited by the same thoughts that often occurred to me when, after climbing a high hill, I saw from the shade of some rock the exquisite panorama spread out before me, and pictured the glorious time Dr. Edward Palmer must have enjoyed, when, climbing the rough hills covered with vegetation, crawling among rocks steaming from recent rains, and sailing around and about the islands and neighboring shores, he so carefully collected a flora then almost unknown and abounding in species new to the scientific world. A few plants were found, however, that do not seem to have been before noticed. One, that disagreeable bush *Atamisquea emarginata*, was seen on the hills near the coast, and as later it was often met with in the neighborhood of Hermosillo, it must be a common plant of this part of Sonora. *Helianthus dealbatus*, in a depauperate form, was found growing on one of the long sand-spits, and as its habitat was supposed to be the seashore sands between San Quentin and Magdalena Bay, this locality considerably extends its range. *Palafoxia linearis* also grows in sandy locations, and in saline soil near tide water bushes of *Avicennia nitida* are sometimes seen.

The cacti of the vicinity of Guaymas seem to have been somewhat neglected and are not noticed in the accounts of its flora. Of course they are difficult plants to make into botanical specimens, and disagreeable to come in contact with, but some of them, when in bloom, are very attractive, and there is a species of Platopuntia, often growing among nearly black rocks that contrast so strongly with its bright red joints as to make it seem from a distance like a mass of brilliantly colored flowers, in fact at first I made the boatman land me on the rocks, which I climbed, so as to be certain what it might be. This cactus is known as "durasnillas," and a little village near Hermosillo that we visited later is named from it Las Durasnillas. A few plants of a scarlet-flowered cereus grow on a sandy island, and afterwards it was seen in abundance in the interior.

Near the city and in many parts of Sonora, *Cereus Schottii*, which on the peninsula received not long ago the additional name *C. Sargentianus*, is common and assumes the various forms in which it grows on the peninsula of Lower California. The most distinct is the one in which the top bears spines similar to the lower part, and, although flower-bearing, large and old, entirely lacks those long white spines so characteristic of this species.

Notwithstanding the adverse conditions, some of the well known plants of the Guaymas flora were in full bloom. *Hofmeisteria crassifolia* blooms in the dry season, as does its near ally, *H. fasciculata*, of Cabo San Lucas, and was now crowned by its myriad of light-pink flowers, and like its Lower Californian relative delights to grow on cliffs just beyond the reach of the ocean spray. Now and then a small tree of *Guaiacum Coulteri* disdaining to follow the example of the other members of its species, covered its leafless branches with a mass of dark sky-blue flowers, and the brilliant effect of its erratic conduct was increased by the staidness of its surroundings, for it was a cloud of blue amongst a crowd of leafless grayish-brown bushes, resting on an ash-colored and baked adobe soil.

Cæsalpinia, *Hyptis*, *Jacquinia*, and other shrubs were evidently endeavoring to produce blossoms and fruit, but the drought was so excessive that only withered flowers were the result. That slender, drooping acacia, *A. Willardiana*, full of flowers and ripe pods, was found to be abundant on rocky ledges west of the city, and again later I was pleased to see it growing on a rocky hill almost within the city limits of Hermosillo.

The street railway of Guaymas ends in a semi-public park, in which grow two trees with willow-like leaves that would not be recognized as belonging to the fig family by anyone knowing only the cultivated figs of California. The owner says they were brought from below San Blas, and Dr. Palmer says that at least one of them grows also wild in the neighboring cañons. These two trees from which were collected the typical specimens of *Ficus fasciculata* and *F. Sonoræ*, are separated by a short distance; one bears numerous aerial rootlets and sends down to the earth roots from its branches; the other has neither of these peculiarities, but, as *F. Palmeri*, of Lower California, sometimes produces an abundance of aerial rootlets, and more often has none, their presence or absence cannot be considered a specific character. The two trees of Guaymas bear a general resemblance to one another; the leaves are alike, and at the time I thought they were one species, and afterwards was surprised to learn from Dr. Palmer that they represented types of two distinct species. Dr. Gustav Eisen, a well-known expert in fig culture, who has seen these same two trees, thinks it possible that they may represent the male and female forms of a single species, and says: "*F. fasciculata* possesses in the April crop of figs very few male flowers, about half a dozen to each fig, and these male flowers are situated in the region around the eye (osteolar region), and are not found dispersed among the female and gall flowers lower down."

Along the railway from Guaymas to Hermosillo and in the surrounding region, one of the most abundant plants is the thorny bush, or small tree, *Olneya Tesota*. At this time all its flowers were open, and they were so numerous that horses and cattle become fat eating them from the branches within reach, and from the ground where they have fallen.

The irrigated fields and gardens about Hermosillo were quite green when compared with the surrounding country, and much vegetation of interest was found, especially along the ditches and in the hedge rows. The dry rocks and hills of course did not produce many plants at this time of the year, but some collections of Perityle made among them, and by Dr. Eisen at San Miguel de Horcasitas, gave evidence that the awns of the pappus may be present or absent in the same species. *Hiræa macroptera*, a perennial plant, very common in the vicinity of Hermosillo, does not seem to suffer from the lack of moisture, for along the roads and in the very driest situations

its bright yellow flowers and winged seeds flourish amongst the surrounding dried-out vegetation.

The most interesting part of Sonora visited was Las Durasnillas, a small collection of houses about sixty miles from Hermosillo, near a mountain range known as Sierra Matapan. At this place was found a flora very different from any before seen, and some moist localities along the base of the mountain had retained their green and growing vegetation longer than was to have been expected. The most conspicuous plant was *Cæsalpinia pulcherrima*, with its large and handsome blossoms, compelling admiration from the least attentive. The very dark-purple flowered *Brongniartia Palmeri* was equally abundant. Some of the Pithecolobiums were in bloom, and under one of them our camp was made, as they furnished more shade than any other tree of the region, but a denser shade would have been more agreeable, because the hot sun found many openings among the scattered leaves and branches through which to send its rays. Among the trees and shrubs some are so different from familiar forms that they are a constant source of interest, and even the inhabitants recognized their peculiarities, and, after exciting our curiosity, guided us to the places where they grew. The cotton tree, *Eriodendron acuminatum*, is a singular tree, having the bark of its trunk thickly covered with large thorns, with leaves like those of the buckeye or horsechestnut, and large yellow flowers that are followed by bolls of cotton four or five inches long. When the fruit bursts and the tips of the twigs and branches of a spreading tree twenty feet high are adorned with good-sized bunches of cotton, the effect is very striking. Another tree, with a trunk sometimes two feet in diameter, that is always nearly white, and for that reason called "Palo blanco," surprises even botanists when they observe its botanical relationship, for it is an Ipomœa, a genus seen in more temperate climates only as low twining herbaceous plants. Among so many interesting plants, a few others are deserving of notice. Erythrina is represented by a single species here, and in Lower California by another very distinct one; both blossom in the spring, some time before the appearance of the leaves, and both retain their long pods after the short-lived foliage has fallen. The abundant large, dark maroon colored flowers are as beautiful in April as are the open pods that expose their scarlet beans in December. *Cordia Sonoræ* is completely covered with flowers that persist on the bushes and assume different shades of

color as they wither. In the cañons is *Vitex mollis*, a tree that is often planted in the gardens of Hermosillo, and many other plants interesting botanically, among which the following, which seem to have been undescribed, were found:—

ABUTILON (WISSADULA) CINCTUM. Perennial, 4–6 dm. high, stems slender, diffusely branching, white, with a thin appressed tomentum: leaves cordate-ovate, crenate-serrate, acute, on slender pedicels of about the same length, upper surface appressed pubescent, pubescence of the lower mixed with stellate hairs: flowers solitary on stout pedicels shorter than the petioles, not jointed: bracts linear-oblong, caducous: calyx cuneate at base, 10-angulate, cleft less than half its length into five lanceolate acute lobes, covered with long spreading hairs, which also occur sparingly on petioles, peduncles, and on the margins and veins of the leaves: corolla ½–2 dm. broad, light-purple or lilac, segments cuneate-obovate, inequilateral, twice the length of calyx, tomentose in the angles, erose at summit: staminеal column very short, horizontal: stamens ⅔ the length of the petals; anthers by the unusual development of the double septum, spuriously two-celled, developing a large quantity of mucus when wetted: ovary 3-celled; ovules three in each cell, the two upper collateral; styles three, capitate, united only at base, minutely and sparsely stellate hairy; carpels three, rounded at apex, loculicidally-dehiscent to the base within, two-thirds the length without, constricted below the middle by a callous ring which is higher anteriorly and posteriorly than at the sides; upper seeds smooth, lower conformed in shape to the cavity, tuberculate punctate at the sides, and crowned by a hirsute ring; radicle superior.

This plant hardly belongs to the genus Wissadula, yet according to Grisebach's Flora of the West Indies, it would be included in the Wissadula section of Abutilon. The constriction between the upper and lower cells is not very apparent externally and does not amount to occlusion of the lower, but insomuch as it approaches Abutilon weakens Wissadula. The shortening of the staminеal column the tricarpellary ovary and collateral ovules occur in other species of Abutilon. It was collected near Las Durasnillas, Sonora, Mexico.

ANISACANTHUS ABDITUS. Perennial, the few stems virgate, indurated herbaceous, bearing short branches, leaves and flowers above, the whole plant minutely puberulent and abounding in stipitate

glands: leaves ovate-lanceolate, 2–3 cm. in length on slender petioles more than half as long, the uppermost reduced to sessile bracts: proper bracts lighter green than the leaves, ovate-lanceolate, a pair sessile in each of the upper axils, 8–12 mm. long, nearly twice the length of the concealed calyx: flowers sessile, one or two in each pair of bracts: calyx cleft to the base, lobes lanceolate-acuminate: corolla rose-color 3–4 cm. long, the rather slender tube somewhat curved and a little longer than the nearly equally cleft and spreading lobes: anther cells muticous, parallel, one very slightly lengthened below: capsule oblong, 2 cm. long, the stipe-like portion occupying half the length; seeds flattened but thick, apparently violet in color, covered with short, sinuous ridges.

This plant was found growing about a spring on the Sierra Mata-pan. Its habit and flowers resemble those of related species, but its large bracts, of a lighter color than the leaves, make this a very distinct one, and the numerous blossoms crowded at the upper part of the stems surpass in beauty those of the well-known members of the genus Anisacanthus.

MAMILLARIA NOTESTEINII BRITTON.

Since the sending of my first specimen to Dr. Britton I have found quite a plantation of them, and after examining a number have thought it best to modify the original description.

MAMILLARIA NOTESTEINII Britton, stems ovate, simple, or occasionally caespitose, 2–8 cm. in diameter. Tubercles nearly terete and about 2 cm. long, spines 12—18 white, becoming gray with age. weak and slender, 1—2 cm. long, spreading. The central spine. which is longer and stronger than the others, is generally tipped with reddish-pink. Pubescent throughout. Flowers 2—4 cm. in diameter, ash-gray, tinged and penciled with a delicate pink. Petals linear oblong, mucronate tipped; sepals fringed; fruit scarlet, obovate; seed black, globose, pitted. Soil and exposure to sunshine changed the amount of coloring and penciling.

Found by the writer in gravelly soil, near a small creek, in this vicinity, June 4, 1891.

F. N. NOTESTEIN.

College of Montana, Deer Lodge, Mont.

NOTES ON THE ANIMALS OF SOME WEST COAST SHELLS.

BY HENRY HEMPHILL.

. *Trivia solandri* Gray. A single living specimen of this beautiful little mollusk recently collected by Miss Ida M. Shepard, at Ballast Point, San Diego Bay, and which she kindly brought to me for examination, enabled me to make the following note on the animal.

When the animal is fully extended, the mantle lobes completely envelop the shell. The lobes are of a brownish flesh-color, thickly though not closely crowded with mammillated tubercles, about thirty-five on each side, flecked and frosted with whitish specks. The tubercles vary some in size and form, the larger ones being rounded and broad at the base, while the smaller ones are narrower and more conical. The nipple-like processes that rise from their summits vary in number from one to four on each tubercle, their tips being also frosted with whitish specks. The spaces between the tubercles are a shade darker than other portions of the mantle, and peppered over with irregular black specks. The edges of the mantle lobes that meet on the summit of the shell are lighter in color than other portions of the mantle, and are also covered with black specks like those between the tubercles.

When the animal is in motion the proboscis extends forward like the bowsprit of a boat; it is about ½ an inch long, a shade or two lighter than the mantles, flecked with whitish specks like those on the tubercles, with its end slightly expanded and edged with white. Two slender tentacles about $\frac{5}{16}$ of an inch long when fully extended protrude from the head near the base of the proboscis, each one bearing a black piercing eye, about midway between their tips and the head of the animal.

The foot is about as broad as the shell, truncated in front and roundly pointed behind, when the animal is in motion. The front of the foot is marked beneath by a very fine transverse dark line, which perhaps serves to define the front edge of the sole. The sole is lighter colored than other portions of the animal that are exposed outside of the shell, and is beautifully and profusely flecked with very small whitish dots.

The animal was slow in its movements, its motion being a contin-

uous glide around the vessel in which it was confined, but most of the time it remained stationary at the edge of the water, as if waiting for the tide to come in, or a chance to escape.

Conus californicus Hinds. The body of this mollusk is whitish in color, and profusely dotted over with black specks that frequently coalesce near the margin of the mantle. When the animal is in motion the foot extends about ¼ of an inch beyond the anterior and posterior ends of the shell. It is truncated in front and bluntly pointed behind. The sole is white and sparsely sprinkled with black specks. The motion of the animal is a constant glide. The proboscis is black, and about ½ an inch long when fully extended, and seems to be a specialized portion of the animal's mantle, rolled together with the lower edges in contact but not joined. It curves over and above the back of the shell, as the animal moves forward. Two small tentacles, of a dark color, each 5 millimeters long, protrude from the head near the base of the proboscis, bearing two small keen eyes, which are situated about half way between the tips and base of the tentacles.

The operculum is horn-color and claw shaped, a portion of the lower or sharp end being free from the animal.

When the animal is in motion this operculum lies transversely across the upper side of the posterior part of the animal's foot.

The nucleus of the young shell is white and glassy, and after a few turns the spire resembles a bluntly pointed, round peg. After this the upper end of the whorls rapidly enlarges, as also does the length of the whorls from the anterior end of the shell to the shoulder.

In the adult the body of the shell is covered with numerous revolving lines, more prominent near the anterior end of the shell.

On the spire of some specimens there are also strong revolving lines, while on others these lines are entirely obsolete. The shoulder of the last whorl is rather concave and forms a shallow subcanal around the shell at the base of the spine, but this, like all other characters of shells, is very variable, and in some individuals it is absent.

The whole shell is covered with a dirty yellowish epidermis that frequently darkens into chestnut color. The shells are quite brittle and very frequently broken, which perhaps is due to the thin, sharp

outer lip, and an excessive amount of carbonate of lime in their composition. The bungling manner in which the animal repairs these fractures does not add to the beauty or attractiveness of the shell, which even in its perfect state is not very inspiring, especially when we consider the beauty of many other cones.

Terebra simplex Cpr. The animal that inhabits this shell is of a pure, pearly white color, without spot or blemish. When fully extended, its foot is about ⅓ the length of the shell. The proboscis is slender, about as long as the foot of the animal, gracefully curved over the back of the shell, and when the animal is in motion it forms an interesting and conspicuous part of the creature, and seems out of all proportions in its length to the rest of the animal's body. This animal has no tentacles, but the eyes are situated on mammillated tubercles that protrude from the body midway between the foot and proboscis. The eyes are small, dark and keen; the foot is truncated in front and rounded behind. The operculum is carneous, unguiculated in form, and lies on the upper side of the posterior part of the foot. This shell is abundant at San Diego and southward.

NOTES ON CALIFORNIAN PLANTS. IV.

BY S. B. PARISH.

VARIATIONS OF CALOCHORTUS VENUSTUS BENTH.

This species, not uncommon in the central region of the State, extends as far south as Elizabeth Lake, in Los Angeles County. Here at its southern limit it is strictly typical; the stem stout and branching and from 18 to 24 inches high; the flowers light lilac, the petals marked above with a reddish stain, below that a brown, yellow-edged occulation, and the basal portion brown-striate; the densely hirsute gland narrowly oblong, and surrounded by scattered hairs. The plants are not very abundant here, but among a considerable number observed not one manifested any noticeable variation.

Hardly fifty miles further north, at Fort Tejon, on the borders of Kern County, they are very plentiful, but here, on the contrary, they show a range of color variation which I have seen in no other plant that has not been subjected to the art of the hybridizer. Specimens growing on the flats about Lake Castac were sufficient to unmistak-

ably fix the species; indeed, they differed only in having the markings less distinct and well defined. But on the precipitous sides of the surrounding grass-clad mountains, where every recess or gentler acclivity was a thickly set bed of these flowers, all the color character of the species vanished. Repeatedly I found it easy to gather from one of these parterres a dozen flowers, each abundantly distinct for a florist's variety, and some of which, if considered by themselves, a botanist might well regard as distinct species. But with all the intermediate variations so profusely present the most diverse extremes were traceable to the original form.

A little study resolved these many-hued varieties into two series, the one of lilacs and the other of yellows. In the former the range of color proceeded from white through varying shades of lilac to a deep purple, the extreme being the var. *purpurascens* Watson. The other series passed through similar gradations from very light yellow to a bright lemon color, which may be identified with the var. *citrinus* Baker.* Sometimes the petals were of uniform color throughout, or were shaded from light to darker tints; in others a lilac petal passed into a yellow border above, or the reverse; others again were yellow striate with lilac, or lilac with yellow. The upper and lower spots of the normal flower were occasionally indicated in these varieties, but in most instances were entirely obsolete.

The glands were uniformly densely hairy, but varied much in size and shape, being oblong, oval, or transversely flattened. In some instances they were obsolescent. All the plants were slenderer stemmed and fewer flowered than in the normal form, single flowered specimens being common, and few exceeded a foot in height. The flowers varied much in size, but were generally smaller than in the type. The whole exhibition appeared to be an example of pure natural variation uninfluenced by hybridization, since no other species was observed in the neighborhood.

Considering how completely all distinctions of color and markings, or of size and shape of gland, here break down, it becomes a question as to what value can be placed on these characters in a group of closely allied species which inhabit the same geographical region.

* In Dr. Watson's Revision of the N. A. Liliaceæ, and in the Bot. of California this is referred as a variety to *C. luteus*, Dougl., the most natural disposition to make from herbarium specimens. But, considering the associations with which it grows on these hillsides it is evident that Baker was right, if the two species are to be kept up.

It is precisely on such treacherous grounds that *C. luteus* Dougl., *C. venustus* Benth, and *C. splendens* Dougl. were established, and more recently *C. Lyoni* Gray and *C. Plummeræ* Greene have been added to the number. Dr. Watson has already suggested that the first two may be confluent, yet in their typical forms they are the most distinct of the set, the first being yellow and the second lilac purple in color. Yet field observation compels the reference of a yellow variety to the lilac-colored species. The other species above named all belong to the lilac series, differing from each other in the distribution and intensity of the coloration. In this respect typical specimens are sufficiently distinct, but considering the unreliability of this character it is not impossible that further observation may unite them.

LILÆA SUBULATA HBK. A rare plant in the South, and apparently the same elsewhere in the State. The only station known to me is the marshy margin of a shallow pond on the farm of Mr. James Stewart, near Colton. Fresh plants show some characters not in entire accordance with the published diagnosis of the species, which was perhaps drawn from dried specimens. Our plant is an annual, the leaves terete, or a little flattened, about six inches long, sheathing at base. Inflorescence axillary, of two forms; an androgynous spike exserted on a peduncle shorter than the leaves, and arising between two sessile ovaries whose filiform styles nearly equal the peduncle. I find no spikes entirely male. The anthers discharge their pollen while the spike is still inclosed in the sheathing bases of the leaves. The radicle fruits mature long before the spicate ones.

GENERAL NOTES
OF A TRIP THROUGH SOUTHEASTERN UTAH.

BY ALICE EASTWOOD.

It was my good fortune the past year, towards the end of May, to travel on horseback through a part of the Great American Desert that has been but little explored. The road followed was a cattle highway from Thompson's Springs, a station on the D. & R. G. W. R. R. in Utah, to Moab, a Mormon town on the Grand River; thence to Monticello, another Mormon settlement at the foot of the Blue Mountains; thence down Montezuma Cañon to the San Juan River,

not far from Bluff City, where the gold placer excitement has recently existed; from there, by way of McElmo Creek and Montezuma Valley, to Mancos, a town in southwestern Colorado.

Mr. Alfred Wetherill, who was my guide, planned the route, managed everything about the camp and horses, helped me greatly in collecting, and, altogether, was as good a friend and as efficient an aid as any botanist could desire.

Thompson's Springs is so named because of its relative nearness to water. In a desert country the watering places become the centers, the named places on the map, and though they may be many miles away from a railroad station, yet more than the small cluster of buildings serve to locate to the cattle men, who are almost the only travelers, the general situation of any place. The name would suggest moisture and verdure, but besides the water tank and a feeble stream of yellow alkali water at the bottom of a gulch, everything was dry. However, it was the period when vegetation was most luxuriant, and the earth was gay with flowers. *Townsendia strigosa* almost carpeting the ground in spots, recalled Burns' "wee crimson-tipped flower; "*Thelypodium ambiguum*, with its branching habit, glaucous foliage, and numerous clusters of rose-pink blossoms, gave brightness here and there; while within the precincts of the station were *Aster tanacetifolius*, *Arabis longirostris*, *Abronia micrantha*, *cycloptera* and *turbinata;* a Conanthus differing most noticeably from *Conanthus aretioides* in its smaller flowers, *Œnothera scapoidea* and *trichocalyx*, *Atriplex corrugata* and *Nuttallii*, and the shrubs so frequent in the desert, such as *Grayia polygaloides*, *Artemisia tridentata* and *spinosa*, *Bigelovia graveolens* and *Tetradymia spinosa*. So many of the desert shrubs are spinose, because nature is here such a niggardly provider that their ambitious efforts to become big plants are thwarted, and they must remain straggling, woody, spiny shrubs.

There was no time for exploring the country around Thompson's Springs, nor for branching off onto the alluring mesas and into the side cañons along the road. An early start had to be made so as to reach a spring at noon and Moab at night, allowing plenty of time for collecting on the way.

Some time after we left the station there stretched before us a range of low hills, where the evidences of upheaval were unusually

conspicuous. On each side of a slight depression, which was a rise compared with our starting place, the bands of strata were tipped up slanting towards each other, and plainly matching. It was from this break in the strata that the cañon began, which at first imperceptibly, but later more decidedly, became deeper and deeper, until when we reached the Grand River, the rocky walls seemed to rise perpendicular for a thousand feet at least, and here and there were carved into wonderful and weird outlines by the action of the air and water. The vegetation constantly changed, for we were not only descending, but also passing from the flora of the plain to that of the cañon.

It was a day full of delight; new plants were constantly seen, and some that may be new species were collected. *Lupinus pusillus* was so abundant over large areas that the earth seemed to mirror the sky, while occasionally the rarer *Lupinus Shockleyi* was also seen; *Cleomella plocasperma*, or a nearly allied form, was found growing in a small tract with a most peculiar and new Phacelia. *Eriogonum inflatum* was common over miles of country, and it was noticeable that the amount of swelling at the nodes varied from absolutely none to more than an inch in diameter. The plants destitute of inflation were small and weak, compared with the others, and the question arose as to the cause of the difference. The evolutionist would regard the variation as an illustration and living proof of the formation of a new species, and would look upon the plants without inflation as the original from which the inflated forms arose. The inflation is a feature especially beneficial to a desert, slender-stemmed annual and undoubtedly takes the place of the involucral bracts that most Eriogonums possess. It furnishes the surface essential to the vital functions of the plant during the ripening of the fruit, since the leaves at the root, by which the plant was enabled to raise its stem and spread out its branches, become dried into dust long before the flowers are gone, and often before they are in bloom. It can easily be seen what an advantage the inflated plants have over the others in the struggle for existence, and they show their superiority in greater size and abundance. They even crowd out other plants and almost usurp the soil. New Astragali were continually seen, and were collected in both flower and fruit. *Gilia Gunnisoni*, *Biscutella Wislizeni*, *Coloptera Newberryi* and *Asclepias involucrata* grew on a

sandy bottom, and the Gilia was most abundant and very lovely. In washes, *Encelia nutans* was frequent. Its large head is full of good sense as well as many flowers. When the flowers expand, the head is erect, so that the sun can have its full effect; but when the seeds are nearly ripe, it begins to nod and droops lower and lower until it finally touches the ground and the seeds scramble out so that they may travel far away from their big-rooted mother on the first rush of water that comes down the hills from the heavy rains that sometimes fall. They thus secure a congenial home in a branch wash and do not have to starve on their greedy mother's leavings.

Through the cañon, which we entered in the afternoon, new and attractive plants began to appear. Here and there *Penstemon Eatoni* lifted its showy stems, covered with scarlet drooping trumpets, demanding admiration. *Malvastrum leptophyllum*, with slender, wand-like blossoming stems, was a fine study in harmony of color, the brick red of its flowers toned down by the silvery green of the foliage. *Aster venustus* here has smaller flowers than at Grand Junction, and with violet rays instead of white. *Amelanchier alnifolia* exhibited a new form, more slender and less leafy than the common one, with few flowers, and the leaves glossy on the upper surface. Some plants of *Rhus aromatica* were seen, with entire coarsely crenate leaves. *Fraxinus anomala* and *Quercus Emoryi*(?) sometimes formed thickets. Piñons and cedars grew along the hills, and bunches of rosaceous shrubs, such as Purshia and Cowania were occasionally observed. Cacti were rare, and but one, an Opuntia, with long, slender white spines, probably a form of *O. Missouriensis* was collected or even noted.

Near the Grand River, the space between the cañon walls became wider. It was a sandy bottom, and the wind blew the sharp little bits of quartz and feldspar into our faces in a disagreeable manner. Twilight was impending, but there was still sufficient light to indicate that a flora more peculiar than any seen yet, existed here. In spite of the raging river that must be crossed we resolved to return to this spot in daylight and explore more fully. *Mentzelia multiflora* was the plant most conspicuous in the waning light, and the star-like blossoms opening at our feet seemed to be trying to illumine the way.

The next day's search was cut short by one of those rainstorms

that are called cloud-bursts, where the water descends in sheets and in a short time starts waterfalls that leap a hundred feet in places over precipices, to the slope below, and then rush to the river. Before the storm, however, we secured a Hoffmanseggia that seems to be new, a peculiar form of *Linum rigidum*, *Eriogonum Thomasii*, *Coldenia hispidissima*, *Poliomintha incana*, *Glyptopleura marginata*, *Euphorbia flagellaris*, *Encelia frutescens*, and fine fruiting specimens of *Coloptera Newberryi*. This had before been collected in flower; but it was only now that its puzzling character began to appear. No two seeds were to be seen that looked alike. It was trying to be a Cymopterus and a Leptotænia at the same time, and even its leaves showed the struggles which it was experiencing. Along the river banks were willows, and the common *Baccharis salicina*. *Berberis Fremonti* grew at the foot of the cañon among the rocks, under which we were perfectly sheltered from the storm. *Stephanomeria exigua*, beautiful with its numerous spreading pink blossoms in the early morning, was a bedraggled object after the rain; *Erigeron Utahensis*, just coming into bloom, seemed to be rare; *Brickellia linifolia* in flower along the slopes, and the young shoots of *B. microphylla*, which is a fall-bloomer, were also observed; *Aplopappus Nuttallii*, *Phacelia crenulata* and *Amsonia brevifolia* were there at home too.

Moab is an oasis in a desert, and its poplars might be compared to the palms that made Palmyra so famous for beauty long ago. It is as renowned, too, among the pilgrims through this land, and we had heard of its beauty, its fruits, and its hospitable people before we started. Its green fields, lovely orchards, and extensive vineyards were such a sudden change from the dry country around that, undoubtedly, the impression of its loveliness was made more vivid from the surroundings.

The next day was spent on a barren highway, where whatever green thing could survive the drought fell a prey to the cattle that were driven over that road. The ground was tramped down and marked with the impressions of innumerable hoofs. Towards evening we entered one of the basin-like cañons, called "washes," peculiar to that region. Here was found a Gilia worth thirty-five miles through the dust and heat. It is one of the most beautiful of the genus, and well deserves the name *superba*, which has been bestowed upon it.

The following day was more profitable in the number of plants collected, but as quantity does not always make up for quality, it is doubtful whether it was really more successful. Here and there on the hillsides *Yucca angustifolia* was sending up its flower-stalks; on the mesas which we crossed, a Frasera, taller and more loosely flowered than *F. albomarginata*, was getting ready to bloom; *Berberis Fremonti* became more common along water courses, and was beautiful with the showy yellow flowers amid its holly-like leaves; *Psoralea castorea* spread over sandy slopes. In a small cañon we found the greatest variety seen in one place, and collected *Allium Nevadense? Penstemon Parryi*, *Ephedra trifurca* in fruit, a small flowered variety of *Gilia congesta*, an Arabis which is probably a beautiful, rose-colored, large-flowered form of *A. Holballii*, found also at Grand Junction, and the widely-distributed *Krynitzkia leucophæa*, the only one of the spicate and glomerate Krynitzkias that can be determined with certainty, because of its smooth, shining nutlets. This cañon led up to a mesa covered with piñons and cedars, and again we were in a region of few flowers, *Penstemon Parryi*, *Gilia congesta*, *and Krynitzkia leucophæa* being almost the only plants under the low trees. We crossed another piñon-covered mesa, after leaving Monticello, and in that little-visited locality found a few plants of *Erodium cicutarium*, the offspring of some darling pioneer. It was a great surprise, and the place at once lost some of its wildness. *Trifolium Plummeræ* seemed common, but was past its period of bloom, and almost of fruit as well.

We were aiming to cut across country, because a cattle highway was so barren, and after great difficulty succeeded in reaching the bottom of Montezuma Cañon, intending to climb up the other side and then ride across an unbroken mesa to McElmo Creek. Montezuma Cañon proved to be a prison from which we could not escape until we reached the San Juan River. Its walls were perpendicular for miles, and impossible to climb with horses. Whenever a hill could be ascended, we toiled up and led our poor animals, only to behold a labyrinth of cañons beyond. However, as we continued to find new plants and were exploring country perhaps as pioneers, we somewhat forgot that our stomachs were empty and our provisions low. *Frasera albomarginata*, *Cymopterus purpureus*, *Calochortus flexuosus*, *Polygala acanthoclada*, *Eriogonum salsuginosus*,

divaricatus, and *glandulosus*, several Astragali, *Gilia pungens*, *Lygodesmia exigua* and *Cnicus Neo-Mexicanus* were among the plants noticed on the rocky hills and cedar-covered mesas. Along the river bottom the grass was high and the trees near the water formed a low grove of box elders, willows and cottonwoods. *Calochortus Nuttallii* was in bloom, and quite common. In general the plants were the same as those usually found not far from water, and as we approached the San Juan River the trees were replaced by *Sarcobatus vermiculatus*, *Bigelovia graveolens*, and *Artemisia tridentata*, so tall as to hide us completely from each other. They all make fine camp fires, but Sarcobatus is the best. We thought that we might also have to try them for internal combustion, but an Indian store on the San Juan River saved us from the attempt.

Along the San Juan River the vegetation was not different from the lowlands of Montezuma Creek; some chenopodiaceous plants were seen, but too young for determination, though as *Grayia Brandegei* was known to grow in that vicinity, all were closely examined and found to be young Atriplices, probably *argentea* and *Nuttallii*. Thickets of *Forestiera Neo-Mexicana* were here and there, and *Lycium pallidum* occasionally replaced the usual desert shrubs. The looked-for Grayia was not found until the McElmo Creek was reached, where many other interesting plants now appeared. *Datura meteloides* was rather startling. It is not supposed to grow so far north, but here it was abundant in the dry bed of the creek and occasionally along the sides. The seed pods are often found in the ruins of the ancient people who once filled this land and guarded every spring with towers of stone. The hackberry, *Celtis occidentalis*, was a new and uncommon shrub; but the other shrubs were those found throughout the whole region. *Œnothera Hartwegi* var. *lavandulæfolia*, was noticeable occasionally, and a few more new Astragali were found, as well as some other plants previously collected, such as Biscutella and *Calochortus flexuosus*. In Montezuma Valley the shrubs were in full bloom, and the hillsides were beautiful with *Peraphyllum ramosissimum*, *Fendlera rupicola* and *Amelanchier alnifolia*. A single plant of the Grand Junction *Chænactis scaposa* was collected, which extends its range two or three hundred miles, the extent of country through which we had ridden during our ten days' trip.

The region traversed belongs mainly to what Dr. C. Hart Merriam

has designated as Upper Sonoran. No mountain species were seen, and but few of those common everywhere along water courses. Animal life was scarce; rarely was even a rabbit noticed or the song of a bird heard.

The careful studies of the plants collected and the list of those noted and collected will form the subject of a paper to which this is an introduction.

GENERAL BIRD NOTES.

EDITED BY WALTER E. BRYANT.

A TRAGEDY IN BIRD LIFE.

One stormy day in December found me on Damon's Point, at the north entrance of Gray's Harbor. A great gale was blowing and the rain and spray were driving in from the sea in clouds. Gun in hand, I strolled toward the beach to view the surf, which was running very high.

A broad, sandy bay made in from the harbor, the upper end of which terminated in a shallow slough about eighteen inches deep. I waded across and was proceeding toward the beach, when my attention was attracted by a small buffle-head duck (*Charitonetta albeola*) commonly called butter-ball. He was swimming around in the slough and obtaining his food in the way common to his kind, by diving and picking up that which came his way. With an admiring glance at his beautiful plumage I was about to pass on, when one of those pirates of the air, a duck hawk (*Falco peregrinus anatum*) came in sight.

Without hesitating an instant, he made straight for my little friend and swooped at him. His long talons came down with a clutch, but they closed on nothing, for the duck was under the water. Undaunted the hawk hovered overhead, and as the water was clear and shallow, he could follow every movement of his prey. Again the duck came up; the hawk swooped to seize him, each move being repeated in quick succession and each dive becoming shorter and shorter.

It was evident that the poor little hunted creature was getting desperate, for the next move he made was to come out of the water flying. The hawk promptly gave chase. There was some clever

dodging in the air, but the duck, frightened and tired, soon saw that his swift pursuer was getting the best of it, so he closed his wings tight against his body and dropped like a stone into the water and plunged out of sight.

Now comes the beginning of the end. While he was under water he either saw the hawk hovering over him or else he became bewildered, for he came again out of the water flying. Like lightning the hawk struck; there was a muffled "squawk," and the tragedy was ended.

SAM. HUBBARD, JR.

PUGNACIOUS FLICKERS.

The following facts were related to me by my brother. And there is a fine skin of one of the birds in my collection.

One day he heard a commotion in the loft of the barn, and, thinking that perhaps the cat had caught a bird, he ascended to discover the cause. In the eaves of the barn was a hole made by woodpeckers. Fighting vigorously through this hole were a couple of flickers (*Colaptes cafer*). The birds made such a din that they did not notice his approach and he easily took the inside one in his hand. The bird on the outside, probably thinking that it had vanquished its enemy, promptly entered in pursuit and was in its turn taken in the other hand.

How blind must have been their rage, and how perfectly oblivious of their own end they must have been, for, although still in the hands of their captor, upon being brought together, they would immediately resume the combat, fighting with bill and claws as though their fate depended upon the result.

It would have been interesting to have discovered the cause of the dispute. Perhaps the explanation may be found in the fact that both the contestants were females, and it may have been the outcome of a fit of jealousy.

EDWARD C. MERWIN.

THE MOCKING BIRD AT REDWOOD CITY, CALIFORNIA.

In regard to the occurrence of the mocking bird (*Mimus polyglottos*) in this vicinity, I would say that the specimen which I now have in my collection was taken here in Redwood City, September 5, 1891. It was hopping about the ground in search of food, and, although exceedingly watchful, could not be called shy, as it ap-

proached within forty feet of me before I saw it. They are rarely seen here; I have met with but three others during the past twenty-five years. Two of them were shot years ago before I knew anything about preserving the skins; the other was seen in 1880 near my home, but was too wary to be collected. They seem to prefer the company of blue jays (*Aphelocoma californica*), as the last three specimens were with large scattering flocks of these birds and apparently flying about the country with them in search of food.

CHASE LITTLEJOHN.

SECOND OCCURRENCE OF THE FOX SPARROW IN CALIFORNIA.

In San Diego County, January 3, 1888, Mr. C. M. Ingersoll collected a specimen of the fox sparrow in no respects different from Eastern examples. (See Proc. Cal. Acad. Sci. Ser. 2, ii, 90.) Another specimen has been obtained in Oakland, by Mr. W. H. Hall, who writes: "The bird was brought to me December 2, 1892, having been found in the city directly under a telegraph wire, and was still warm."

W. E. BRYANT.

NESTING OF THE FLORIDA GALLINULE (*Gallinula galeata*) NEAR LOS ANGELES, CAL.

I now have a set of nine eggs of this bird: they were collected west of the city, just outside of the city limits, by William Berman, April 27, 1890. Nest was composed of tule, situated in a bunch of tule in a creek. One or two other sets were obtained at the same time and place. A bird was shot and identified by L. Zellner, of this city.

M. L. WICKS, JR.

OCCURRENCE OF CLANGULA HYEMALIS IN CALIFORNIA.

Mr. W. H. Hall has brought to me for identification a female specimen of the old-squaw (*C. hyemalis*), which was shot at Point Reyes, north of San Francisco, about January 17, 1893, by Mr H. Weiss. In the Proceedings of the California Academy of Sciences (2d. Ser., ii, p. 88) Mr. T. S. Palmer recorded a male specimen from Humboldt Bay. While of rare occurrence in this State, it may be considered a casual winter visitant.

W. E. BRYANT.

RECENT LITERATURE.

The Occurrence of Cooper's Lemming Mouse (Synaptomys cooperi) in the Atlantic States. By DR. C. HART MERRIAM. Proc. Biol. Soc. Wash. VII, 175–177. Notices of the capture of additional specimens of this species, rare in collections, Baird's type of which the author supposes came from New York State, possibly from New Jersey.

The American Naturalist, January, 1893: "A new Synaptomys from New Jersey," by Samuel N. Rhodes. This new species is named *Synaptomys stonei.* "A new Evotomys from Southern New Jersey," by Witmer Stone. This new subspecies is named *Evotomys gapperi rhoadsii.*

The January number of *The Auk* has two half-tone plates, illustrating an article by Charles Slover Allen, on "The Nesting of the Black Duck on Plum Island." One represents a nest in a thicket, the other a group of black ducks, two adult birds with young, from the representation so successfully executed by Mr. Richardson for the American Museum. "Notes on Certain Washington and British Columbia Birds," by Samuel N. Rhoads. A preliminary paper with a list of additions and critical notes on the status of *Corvus americanus, C. caurinus, Melospiza lincolni striata,* which is considered "less entitled to recognition than certain subspecies once included, but now stricken from the check list." One of these "stricken" forms is *Vireo gilvus swainsonii*, for which evidence is offered for its re-instatement. *Sylvania pusilla pileolata* is considered a very weak subspecies. One new subspecies is described from the central Rocky Mountains of British Columbia, *Parus hudsonicus columbianus*, Columbian Chickadee, of which the A. O. U. committee will take cognizance. "Description of a New Junco from California," by Leverett M. Loomis, *Junco pinosus*, Point Pinos Junco, from near Monterey. The fifth supplement to the check-list of North American birds, which appears in this number, contains important additions and changes. The sparrow hawk of California becomes *Falco sparverius deserticolus* Mearns, Desert Sparrow Hawk. *Vireo vicinior californicus* Stephens was "considered as not entitled to recognition." Mr. T. S. Palmer proposes *Heleodytes* Cabanis for *Campylor hynchus* Spix antedated by *Campylirhynchus* Mergele, a genus of coleoptera.

Gordiodrilus is the name of a new genus of Oligochæta provisionally placed in the family of Ocnerodrilidæ by its describer, F. E. Beddard (Ann. and Mag. Nat. Hist., ser. 6, Vol. x, No. 55). The genus comes near the American genus Ocnerodrilus, which later reaches its greatest development, as far as is known, on the Pacific Coast. Gordiodrilus differs from Ocnerodrilus in having only one œsophageal diverticulum in somite ix, Ocnerodrilus having this organ paired. The male or spermduct, which in Ocnerodrilus opens in somite xvii, always in the same pore as a prostate, opens in Gordiodrilus in somite xviii, always in a different pore from the prostate, but in the same somite as that organ. Beddard describes five species of Gordiodrilus from Africa and the West Indies. The memoir is very interesting to Pacific Coast investigators, as the new genus forms a connecting link between Ocnerodrilus and the higher terrestrial Oligochæta. Here may be incidentally mentioned that a new genus not yet described, recently found in Baja California, is in many respects intermediate between Ocnerodrilus and Gordiodrilus, having one pair of diverticula in somite ix, originating in the anterior part of the somite. The spermduct opens in somites xviii and xvii, the posterior one independently of the prostates, one pair of which open in somite xvii and one in xix. G. E.

"Expedition a la gruta de Cacahuamilpa." Under this heading we find a memoir of twenty pages, describing the results of a collecting expedition to a cave called "Cacahuamilpa," somewhere in Mexico; the exact locality is not given ("El Estudio," Tom IV, No. 8, Mexico, Sept., 1892).

The memoir is accompanied by two plates containing forty-five drawings of animals, described as new in a most singular manner. There are eleven species pretended to be new, ranging in almost as many different families, from Coleoptera to mollusks and mammals, and all are given as specific name "cacahuamilpensis." Many species are given a new name, probably in order that all may be uniformly "cacahuamilpensis," though the old and first name is sometimes kindly appended. The descriptions are such that not a single species can be identified, not even as to genus, and the figures are in the style of those seen in our daily newspapers.

It would have been much better to distribute the collections to specialists than to disgrace the zoölogical literature in this way.

Unhappily we are promised a continuation, which, if in a similar style as the first part, will no doubt cause the author to become a great light among the natives, but which must nevertheless be considered at a par with similar attempts one hundred and fifty years ago. How many of these "cacahuamilpensis" are really cave-species probably no one will ever be able to tell. G. E.

Description of a new sucker (*Pantosteus jordani*), from the Upper Missouri Basin. By Barton W. Evermann. Extract from Bull, U. S. Fish Commission for 1892. The name is in compliment to Prof. Jordan of Stanford University. The material was collected in the streams of Montana and South Dakota. The author recognizes four species besides the new one, and gives their synonomy and distribution.

Flora Peoriana, by FREDERICK BRENDEL. This paper catalogues the plants within a radius of ten or twelve miles. The vascular plants number 835 species. The paper is replete with interesting data not usually found in such catalogues. K. B.

Development of the Frond of Champia parvula, Harv. *from the Carpospore*, with one double plate. By BRADLEY MOORE DAVIS. Extract from Annals of Botany, No. xxiv. This interesting addition to our knowledge of *Champia parvula* is one of the first fruits of the Stanford University course in botany. Mr. Davis was in charge of the summer course of botany at the Hopkins Seaside Laboratory last year, and is now following a postgraduate botanical course at Harvard University. We hope to welcome him again to the Pacific Coast next year. K. B.

Additions to the Flora of the Cape Region of Baja California (Ext. from Proc. Cal. Acad. sec. 2, Vol. iii), by T. S. BRANDEGEE. In this paper Mr. Brandegee adds 59 species, Nos. 681–739, to the known flora of the region. Notes of interest concerning some previously listed species are given and the following new species proposed: *Dalea trochilina*, *Acacia Californica*, *Albizzia occidentalis*, *Dianthera incerta*. K. B.

Erythæa, a journal of botany, West American and general, edited by Willis L. Jepson, a pupil of Prof. Edward L. Greene. The new journal is to be a monthly of about twenty-five pages apparently.

The contributors to the first number are Prof. E. L. Greene, two papers; Willis L. Jepson, two papers; F. T. Bioletti, descriptions of two new plants. Teratological notes (reversion of the flowers of *Leptosyne maritima* and *Tropæolum minus*) by Marshall A. Howe. Reviews and criticisms, miscellaneous notes and news. The inside of the cover is apparently modeled after some of Rafinesque's publications, containing an advertisement of the journal within the first cover, and a list of the "principal botanical writings" of Professor Greene inside the back

The motto of the journal might fitly be the following paragraph from the introduction to Rafinesque's "Neobotanon," Part 4: "As I think that I am gifted with a peculiar sharp sagacity in discriminating Genera and Species of Plants and Animals, it behooves me to use it in order to rectify these objects and the sciences relating thereto. – It is what I have often done, am now doing and will continue to do as long as I live, not being prevented by the sneer or neglect of anyone whom I consider less sagacious than myself, who cannot discriminate between the most conspicuous characters blended by the Linneists or modern Blenders and Shufflers."

Mr. Greene starts out by alluding to his "reasons for accepting the Cichoriaceæ as a separate natural order, forgetting, perhaps, his experience in describing "*Prenanthes stricta*," and makes declaration that "for the nomenclature of genera we are not disposed to recognize any particular initial date." The usual contributions to the synonymy of Western botany to be expected in a publication over which Mr. Greene has control, follow. *Pulsatilla multiceps* may be, from its very imperfect description, almost anything. *P. Micheneri*, appears from the character to be a rather more glabrous form of *P. Bolanderi*, that species having cuneate-obcordate petals and 10 dilated filaments, the alternate ones shorter.

Mr. Greene has of course a perfect right, if so inclined, to reduce *Potentilla Breweri* to *P. Plattensis*, but why not call it var. *Breweri* instead of var. *leucophylla*, more especially as *leucophylla* has been used in the genus already several times. *Potentilla ambigens* and *P. scopulorum* are perhaps of that genus, though experience has shown that it is not always safe to assume even that degree of accuracy on the author's part, and there is hardly anything in the descriptions to prove that he is not describing forms of, *Barbarea vul-*

garis, for instance. No information is "vouchsafed" as to whether the plants are annual, biennial, or perennial; both species are said to have "about 5 pairs of leaflets," but whether scattered on long petioles or crowded near the top of them is left to the imagination along with such unconsidered trifles as stipules, bractlets, petals, stamens, styles, akenes, etc. Absolutely the only mention made of the floral organs is "flowers small, yellow," in one case, and corollas nearly an inch in diameter, pale yellow," in the other!

Sanicula nemoralis is, as Mr. Greene remarks, the yellow-flowered form of *S. bipinnatifida*. *Sanicula saxatilis* has been collected at Tehachapi, and is probably not uncommon about rocky summits. It has heretofore been considered a form of *S. tuberosa*. *Sanicula septentrionalis*, described from an immature fragmentary specimen distributed under the name *S. Nevadensis* may easily be that species. Mr. Greene's idea of the great importance of the outline, or degree of dissection of a dissected leaf will scarcely commend itself to botanists who know anything about Umbelliferæ. *Microseris indivisa* is a well-known form of *M. aphantocarpha*. *Senecio Blochmanæ* is of course the entire-leaved form of *S. Douglasii*, already provided with synonyms to spare. *Peucedanum robustum* was sent from the type locality to Coulter & Rose at the time of their revision of the Umbelliferæ. They did not find it to be a new species.

Mr. Jepson's account of the mountain region of Clear Lake is remarkable chiefly for the things he did not observe. All the plants mentioned by him have been in the herbarium of the California Academy of Sciences for nearly ten years. *Streptanthus hesperidis* is *S. Breweri* pure and simple. *Arctostaphylos elegans* is another of the absolutely inexcusable synonyms with which that long-suffering genus is becoming loaded. *Gnaphalium bicolor* is so imperfectly described that even the section to which it belongs can only be conjectured from the remark that it can readily be distinguished from *G. leucocephalum*. It is probably only a rather broader-leaved form of that species which belongs to the division "leaves obviously adnate-decurrent, the upper face at least becoming naked and green in age, and with the stem glandular-pubescent or glandular viscid; herbage strongly balsamic-scented; root lignescent-perennial."

Apparently the best species, and certainly the best described is *Collinsia Franciscana;* but the description would have been much

improved if the author had given us some idea of the curvature of the throat, the presence or absence of crests and some indication of the shape of the seeds. As these points are usually attended to in descriptions of Collinsia, their lack leaves few data for comparison. In all species where account is made of the seeds, the ovules should be numbered instead, as they are usually much less variable. It is probably identical with Dr. Kellogg's *C. solitaria*, which was described from the vicinity of Oakland. No type specimen has been found, but the description so far as it goes agrees with the San Francisco plant. The original *C. sparsiflora* was however a coast plant collected a short distance above San Francisco, and before attempting to separate species from it, it would be well to examine the type which is only too likely to be the same as *C., Franciscana*.

In "Notes and News" Mr. Greene takes occasion to sneer at a paper by Professor Coulter and Mr. E. M. Fisher in the November number of the *Botanical Gazette*, on account of the personal names bestowed on the new species. It must be admitted that such names are not in the best taste, but the remarks thereon come with poor grace from the author of *Madia Rammii*, *Clevelandia Beldingii*, *Potentilla Micheneri*, *Streptanthus Biolettii*, *Bœria Burkei Convolvulus Binghamiæ*, *Collomia Rawsoniana*, etc., etc. Perhaps, however, the creator of these names salves his conscience by remembering that they are principally synonyms.

K. B.

Contributions from the Botanical Laboratory of the University of Pennsylvania. Vol. i, No. 1. Unlike the usual contributions from botanical laboratories, the papers contained in this are largely physiological. They are: A monstrous specimen of *Rudbeckia hirta*, by J. T. Rothrock; Contributions to the history of *Dionæa muscipula*, by J. M. MacFarlane; An abnormal development of the inflorescence of Dionæa, by John W. Harshberger; Mangrove tannin, by H. Trimble; Observations on *Epigæa repens*, by W. P. Wilson; A nascent variety of *Brunella vulgaris*, by J. T. Rothrock; Preliminary observations on movements of the leaves of *Melilotus alba* and other plants, by W. P. Wilson. The volume is enriched with twelve plates.

Contributions to the Life Histories of Plants. No. 8. By THOMAS MEEHAN. Extract from Proc. Philadelphia Academy, 1892.

This is another of the interesting papers recording observations, principally on the fertilization of flowers, of which several previous

ones have treated. The plants discussed are *Euphrasia officinalis*; Gaura and Œnothera; the carpellary structure of Nymphæa; the sexual characters of Rhus; *Rubus Chamæmorus*, *Dalibarda repens*; some morphological distinctions in the genera of Ericaceæ; vitality of seeds in *Lysimachia atropurpurea; Campanula rotundifolia; Cornus Canadensis; Aralia hispida; Luzula, campestris, Cakile Americana, Hypericum ellipticum, Trifolium hybridum; Lathyrus maritimus; Lonicera cærulea; Raphanus sativus;* the nature of the verrucæ in some Convolvulaceæ; *Polygonum cilinode; Aster Tatarica.* The observations are of a kind to be readily made by anyone with leisure and access at all hours to living plants, and require no great knowledge of systematic botany, yet they are of great general interest, and more attention to the physiology of plants would attract to their study many now deterred by the somewhat dry details of herbarium work.

List of Plants of Los Angeles County, California. By ANSTRUTHER DAVIDSON, M. D. Local lists are always useful even if very incomplete—they stimulate search. The next issue will probably contain a much larger number. There are many in the herbarium of the California Academy of Sciences, from Los Angeles County, not mentioned in this. In Oxytheca, for instance, *O. trilobata* grows at Ravina, and *O. lutea* at Lancaster. *Boisduvalia cleistogama* is probably an error of determination. The rather numerous printer's errors will of course be rectified in subsequent editions.

Flora Washingtoniensis. By W. N. SUKSDORF, is a list of the flowering plants and ferns of the State of Washington. These lists are of great service in the study of the distribution of plants. Washington is a highly objectionable name for a State, as it requires always an explanatory phrase to distinguish it from the better-known seat of the general government.

Contributions from U. S. National Herbarium. Vol. i, No. vi. i. List of plants collected by C. S. Sheldon and M. A. Carleton in the Indian Territory in 1891. By J. M. Holzinger. ii. Observations on the native plants of Oklahoma Territory and adjacent districts. By M. A. Carleton. Two new species *Ipomœa Carletoni* Holz and *Euphorbia strictior* Holz are described, with plates, and *Euphorbia polyphylla* Engelm is characterized. Many interesting observations on the relationship of allied species and the distribution of plants are scattered through the papers.

Check List of the Plants of Kansas. By BERNARD B. SMYTH. Aug., 1892. This is an attempt to give a complete list of the plants of the State with approximate localities. The introduction shows an originality not common in catalogue makers. The author says: "As to nomenclature the compiler simply adopts those names said by common authority to be the correct ones. He is opposed to changes of name in a plant, and prefers a name long-established and well-known to a name which though more correct, is comparatively unknown. Notwithstanding this, exceptions are made, where evidence is indisputable as to priority of some other name as applied to a particular plant. Most noticeable among these is Hicoria instead of Carya, Navarretia for Gilia, Castalia for Nymphæa, and others. . . . Where no name is given the compiler doesn't know who is authority. . . . A few radical changes are made, as the transferring of the order Nymphæaceæ from Exogens to Endogens, these plants showing most clearly endogenous characteristics of structure. Conversely the order Smilacaceæ should be transferred to Exogens, these plants being exogenous when more than herbaceous."

Under the head of "New Species" are included *Erythronium mesochoreum* Knerr, n. sp.; *Cyperus carruthii* Wood, n sp.; *Cyperus spiculatus* Wood, n. sp.; *Setaria perennis* Hall, n. sp. *Sporobolus pilosus* Vasey n. sp.; *Barbula henrici* E. A. Rau, n. sp. All of these "new species," excepting two, are credited at the end of the character to previous places of publication.

PROCEEDINGS OF SOCIETIES.

CALIFORNIA ACADEMY OF SCIENCES, *November 7, 1892.* President Harkness in the chair.

Donations to the museum were reported from John Carlsen, Gustav Eisen, Carl Precht, Dr. J. G. Cooper, John L. Howard.

November 21, 1892. Mr. T. H. Hittell in the chair.

Donations to the museum were received from Willard M. Wood, Miss Lottie Rau, George H. Knight, Sam Hubbard Jr., Overend G. Rose, M. H. Gilson, T. S. Brandegee.

The Librarian reported 104 additions to the library.

Mr. H. W. L. Couperus read a paper on the possibility of the cultivation of coffee within the limits of the United States.

December 5, 1892. President Harkness in the chair.

Additions to the museum were reported from Walter H. Levy, Gustav Eisen, William Hooper, W. G. Blunt, John P. West, Compañia Minera y Beneficiadora de la Barranca, Sonora, Mexico.

The Librarian reported eighty-four additions to the library.

A resolution was adopted to the effect that the Academy heartily indorses the proposition to secure an appropriation from the State Legislature that will cover the annual expense of $25,000 to secure a topographical map of the State, the general government consenting to coöperate with the State to the extent of superintending the work, and appropriating a like amount annually.

December 19, 1892. President Harkness in the chair.

Additions to museum were reported from Herbert Kellogg, Walter H. Levy, W. E. Steadman, Baron Bœselager, Walter E. Bryant, G. E. Colwell.

Eighty-three additions to the library were reported.

The Nominating Committee presented a report embodying a ticket to be voted at the annual election.

January 3, 1893. Annual meeting. President Harkness in the chair.

Additions to the museum were reported from Ed Garner, P. F. Rountree, Dr. Julius Rosenstirn, Wm. F. Nolte, Charles Allison.

The annual reports of the officers and curators were read and ordered filed.

The report of the officers of election was read and the following were declared elected for the ensuing term:

President—H. W. Harkness.

First Vice President—H. H. Behr.

Second Vice President—J. G. Cooper.

Corresponding Secretary—T. S. Brandegee.

Recording Secretary—J. R. Scupham.

Treasurer—L. H. Foote.

Librarian—Carlos Troyer.

Director of Museum—J. Z. Davis.

Trustees—W. C. Burnett, C. F. Crocker, D. E. Hayes, E. J. Molera, George C. Perkins, Adolph Sutro, John Taylor.

January 16, 1893. President Harkness in the chair.

Additions to the museum were reported from Charles Allison, W. G. Blunt, Chase Littlejohn, Charles Fuchs.

Mr. W. L. Watts read a paper on the Geological Economics of the Central Valley of California.

CALIFORNIA BOTANICAL CLUB. *November 23, 1892.* Mr. J. M. Hutchings in the chair.

The following were elected to membership: Samuel H. Hammond, Sidney S. Peixotto, Mrs. A. E. Bush, L. C. Cummins, Miss Mary C. Day, Prof. John Dickinson.

Dr. Gustav Eisen read a paper on the figs of Sonora and Lower California.

CALIFORNIA ZOOLOGICAL CLUB. *December 10, 1892.* Vice President Walter E. Bryant in the chair.

The following were elected to membership: Wm. F. Greany, Dr. H. N. Miner, Fred A. Seavey, W. P. Steinbeck, Aurelius Todd, Prof. C. H. Tyler Townsend, F. S. Plimptom, Dr. Clark, J. Burnham, Overend G. Rose, Mrs. E. S. Alexander.

Mr. Walter E. Bryant read a paper on the zoölogy of Baja California.

Mr. Charles A. Keeler called attention to some of the peculiarities of the fauna of Lower California as illustrating certain laws of evolution.

MISCELLANY.

THE INVESTIGATIONS OF THE COLLECTIONS OF THE EXPEDITION TO BAJA CALIFORNIA.

The California Academy of Sciences of San Francisco has at various times, during the last five or six years, sent small expeditions to the peninsula of Baja California, for the purpose of exploring and collecting natural history specimens of the higher as well as of the lower classes. Various parts of that hitherto little-known country have been visited during the different expeditions, and much material has been brought together for future study. The result has been that the fauna of Baja California is becoming better known, presenting many features of great interest. The flora of this country has been already minutely described by T. S. Brandegee, who has added a

large number of species and several new genera to those already known, enabling us now to judge with great certainty as regards the geographical distribution of the plants and their connection and descent from neighboring geographical plant districts. New species will of course after this be added to those already described and enumerated, but they will be comparatively few, and the flora of Baja California can now be said to be very completely and comprehensibly known. Of birds and mammals the collections brought home are large and good, and descriptions of some thirteen new rodents will soon be published by W. E. Bryant. They are mostly the results of his trapping during last year's expedition to the Cape region, or the southern extremity of the peninsula, remarkable for its high mountains, beautiful and luxuriant vegetation, tropical climate and isolated position.

The fresh water fishes collected there are in the hands of Prof. Gilbert, of the Stanford University. The collection of reptiles and batrachians is good and when described will undoubtedly contain much of general interest. A large collection of arachnids from the Cape region, collected during the late expedition, is now in the care of Prof. George Marx, of Washington, the acknowledged authority on American spiders. He designates the collection as valuable and interesting. His paper will be well illustrated. A collection of Colembolas and Thysanuras is being worked up by Prof. Harold Schött, a well-known European specialist, who has already described a number of new Colembolas from Upper California, and who has since received a number of new forms both from Upper and Baja California, all of which are to be embodied in one general paper, on the Colembolas and Thysanuras of the Pacific Coast. Dr. Otto Stoll, of Zurich, whose beautiful work on acarides in the *Biologia Centralo Americana* is generally admired, will describe a small collection of acarides, principally from the Cape region. The collection of diptera from Baja California is not large, but it may be counted upon to contain much of interest. It will be described by C. H. Tyler Townsend, a well-known specialist of this class of insects.

The collection of orthoptera has been forwarded to Lawrence Bruner, and a valuable paper from his hand is expected, though his preliminary opinion on the collection has not yet reached us. The coleoptera were well represented with some 500 species, principally

from the Cape region. They are now in the hands of Dr. Horn, of Philadelphia, who will describe the new forms at an early date.

The land shells, some twenty-two species collected during the late expedition to the Cape region, contain some eight or ten new species, descriptions of which will soon be published by Dr. J. G. Cooper, who has already written upon the subject of Baja California land mollusks. The land and fresh water oligochæta contain a number of new forms, which are being described by Dr. Gustav Eisen, in connection with other Pacific Coast oligochæta. The species found in the Cape region are entirely tropical, and show most relationship with tropical Mexico and Central America.

The fresh water crustaceans, of which many remarkable forms were collected in the clear waters of San Jose River, will be described by Walter Faxon, of Cambridge.

G. E.

NOTES ON THE CLIFF DWELLERS.

In Southwestern Colorado and in Arizona there have recently been extensive explorations of the ruins of a people now extinct, but probably related to the Pueblo Indians at present living in Arizona. The relics found in their houses indicate that they were an agricultural people, and to strengthen this belief remains of ancient reservoirs and aqueducts exist on the mesas above. There, too, are ruins of houses and towers which were probably occupied before defense became necessary and the people fled to the cliffs. The mesa ruins have usually become mounds overgrown with vegetation, but the cliff houses, from their sheltered position, are in a good state of preservation.

It may be interesting to record the uses they made of some of the plants of the region as well as the plants which they cultivated that grow there no more.

Corn, squash, and beans were the chief crops; the walnuts now and then discovered were probably brought from further south with the cotton which has been found on the pod, spun into thread, and woven into cloth. Undoubtedly, they had commerce with their own people further south, or with other tribes, for seashells have been found matted in the hair of the dead, salt most carefully preserved in balls, and for their arrow points, stones not found near by.

The most valuable textile plant was *Yucca baccata*, the fruit of

which most likely served as food. The Utes at the present time dry large quantities cut into strips for winter use. The Yucca fiber was separated into threads, which were twisted into strands varying in thickness according to the purpose for which they were designed. The best sandals were made of the fine thread, woven so as to be ornamented with geometrical designs; for the commoner sandals they used coarser twine, while the coarsest ones are of braided rushes. They depended for warmth upon a fabric made of turkey feathers ingeniously woven with Yucca twine. The long feathers were split and twisted around the Yucca thread, which was then loosely woven into a blanket of feathers soft and warm. The dead are often found with this for the first covering. The skins of deer were used, too, but rarely, probably because of the difficulty of securing them with their poor weapons. They either raised turkeys or the wild ones were abundant, since implements such as awls and needles were made of the bones, and turkey bones blackened with fire are common.

The common rush *Phragmites communis* was used to make a coarse matting, not unlike that which is packed around tea-chests, but woven in different designs. This was used as a second covering for the dead. Willow twigs fastened together something like the slats of Venetian blinds formed the outside cover, the coffin of these prehistoric people. The Yucca fiber, in connection with the common Juncus, was used in making baskets finer than any made by Indians of the present day.

The piñons and cedars are thick on the mesas of this country, and the former furnished an edible nut which the cliff dwellers collected for food. The timbers for their houses were chiefly cedar, as shown by the beams that still form the floors of the upper rooms and the supports of balconies. These beams are curious, pointed at the ends and very jagged from the stone axes used to roughly hack them into shape. Coarse grass with stiff stems, *Oryzopsis cuspidata*, was tied into bundles to make brushes, probably for the hair. The wild tobacco, *Nicotiana attenuata* is common near their homes and in the cañons where their houses stand like statues in their rocky niches the wild fruits are more abundant than elsewhere, leading to the belief that to some extent they were cultivated. A. E.

NOTES ON GAME LAWS, ETC.

Notwithstanding the rain and cold weather of this year Mr. W. O. Emerson reports that Anna humming birds have commenced building in the eucalyptus trees near his house.

The earliest record of the nesting of this species near San Francisco was made by Mr. Ingersoll, who found a nest with two far advanced eggs on January 14; the winter was a more open one than the present.

By the first of March half a dozen or more resident species will have commenced nest building, and the small boy will prepare a box of bran to receive the "collection" which he makes annually, and which is annually destroyed by mice or otherwise. Such pernicious collecting should be discouraged by parents, and might profitably receive some attention from the would-be makers of perfect game laws for California.

Some radical changes are contemplated when the next legislative "tinkering of the game laws" takes place. Like most proposed alterations of the kind there are some good and some injurious. To provide an open season in California for elk, antelope, and mountain sheep is to assist in their total extermination in this State; too many are killed in defiance of the law as it is. The fault is not so much with the law as with the lax enforcement and a deplorable lack of respect for game laws by the public.

Elk are not rare in some places in Southwestern Oregon, and the theory that persecution in that State has resulted in an immigration of elk to California is extremely probable, but no one need suppose that they are spared to any great extent after crossing the boundary line. The law stops the marketing of elk, and in some instances deters parties from hunting for them, but not always. It is not many months since a large expedition, thoroughly equipped, left San Francisco for Northern California, and it was no secret that they were prepared for illegal game.

Every little while some one comes forward with schemes of restocking the State with mammals, birds, and fish, without a thought of what the possible results may be from the introduction of exotic species. There can be no question as to the desirability of at some time introducing new game, but that time will be after the na-

tive species are actually protected, and that time will never come until better enforcement and a more wholesome public respect for game laws is secured. W. E. B.

NEWS.

Prof. W. R. Dudley, late of Cornell, has taken the chair of systematic botany at Stanford University. With such men as he and Prof. Douglas H. Campbell in charge of the botanical work of Stanford University, where botany is taught according to modern methods, we may expect to have, in time, a body of resident botanists whose entire stock of botanical knowledge is not confined to the possession of a limited terminology and a large capacity for discovering new species that do not exist.

Miss Alice Eastwood, formerly of Denver, Colo., has succeeded Mrs. Katharine Brandegee as curator of the Herbarium of the California Academy of Sciences, and as acting editor of ZOE.

Mr. Oscar T. Baron has temporarily housed his magnificent collection of butterflies and humming birds in the California Academy of Science building, where he spends much of his time arranging and studying. He contemplates this fall an extended trip to Ecuador and the central Andes for the purpose of collecting butterflies and humming birds, his collections in these lines from South and Central America and Mexico being among the richest known.

Mr. W. Otto Emerson, who has been studying art in Europe for the past two years, has returned to his home in Haywards, Cal.

On the 1st of February Mr. Charles A. Keeler sailed for New York on the ship *Charmer*. His latest contributi n to science, entitled "Evolution of the Colors of North American Land Birds," forming No. iii of the Occasional Papers of the California Academy of Sciences, has been received too late for review in this issue.

Nine new species of Ocnerodrilus have lately been described by Dr. Gustav Eisen in the Proceedings of the California Academy of Sciences (the memoir not yet published). Two of the species are from the Cape region of Baja California, one from Sonora, Mexico, and the others from Guatemala. Dr. Eisen is now describing the Pacific Coast Oligochæta, and will be glad to receive specimens for examination.

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